

ON
DIET AND REGIMEN
IN
SICKNESS AND HEALTH.

DR. DOBELL.

SIXTH EDITION

Charles Brett
27 Spring St
Spalding
1905

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27 Spring St
Spalding
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ON- DIET AND REGIMEN

Etc.

ON
DIET AND REGIMEN

IN
SICKNESS AND HEALTH

AND
ON THE INTERDEPENDENCE AND PREVENTION OF DISEASES
AND THE DIMINUTION OF THEIR FATALITY

BY
HORACE DOBELL, M.D.

CONSULTING PHYSICIAN TO THE ROYAL HOSPITAL FOR DISEASES OF THE CHEST
PHYSICIAN TO THE ROYAL ALBERT ORPHAN ASYLUM,
ETC., ETC.

SIXTH EDITION REVISED AND ENLARGED.

LONDON:
H. K. LEWIS, 136 GOWER STREET, W.C.
1875.

In Memoriam

(1872)

ONCE MORE I MAY REPEAT THE THANKS,
EXPRESSED IN ALL THE FORMER EDITIONS OF THIS WORK,
FOR THE GENEROUS ASSISTANCE I HAD RECEIVED
IN MY SCIENTIFIC CALCULATIONS
FROM THE ARITHMETICAL SKILL OF MY DEAR OLD FRIEND
J. J. FARRANTS, F.R.C.S.
LATE PRESIDENT OF THE MICROSCOPICAL SOCIETY;
WHOSE GENIAL SPIRIT
HAS NOW FOR EVER PASSED
BEYOND THE REGIONS OF SCIENCE AND CALCULATION
TO
“THAT UNKNOWN, TRACKLESS LAND, FUTURITY;
GREAT HERITAGE, WHERE NO MAN KNOWS HIS PART.”

PREFACE TO THE SIXTH EDITION.

IN introducing a former edition of this work, I stated that my object and endeavour had been to produce a small book founded upon accurate scientific data—a book from which a doctor might refresh his memory, and at the same time one which he might safely place in the hands of his patients, to enlighten them on some of those important points which ought to be understood by the non-professional and to teach them how vast and intricate is the science and art of “*rational medicine*.”

This object and endeavour I have steadily kept in view, in preparing the present edition. To keep it “small,” I have cut out all that I thought could be spared; while to maintain its character as a scientific and practical “refresher” to both doctor and patient, I have been obliged somewhat to increase the size of the volume by the following additions:—

In Chapter I. fresh matter is added under the heads “Smoking” and “Afternoon Tea.”

In Chapter II. I have added a new column to the Analysis Table, giving the Mechanical Equivalents of the British units of heat for each article analysed; also a Table of the weight and cost of various alimentary articles re-

quired to yield sufficient force to raise a certain weight to a certain height; and an epitome, by a well known writer, of the most recent views with regard to food, heat, and motion.

In Chapter III. I have added thirteen pages "On the Wholesomeness and Digestibility of various articles of food," which I hope will be of much use to those who desire to avoid dyspepsia; and a Table is given shewing the percentage of water in various foods in common use; and some remarks on different modes of cooking.

In Chapter V. I have added to the article "On Getting Thin," some directions for "Getting Fat"; and I would especially call the attention of parents and of children's doctors to an article on "Fat and Starch in the Nutrition of Children," at p. 112.

In Chapter VI. I have added some remarks on "Acid, Gout and Rheumatism from Fermented Liquors."

In Chapter VIII. I have added new Recipes, Directions, and Appliances for the Sick-room, under numbers 4, 11, 12, 15, 18, 19, 20, 21.

In Part II., Chapter IX., a Table shewing "the Interdependence of Winter Cough with other Diseases" has been introduced; and, finally, the Index has been thoroughly revised.

PREFACE TO FIFTH EDITION.

THIS work was much enlarged and nearly re-written in its last edition just two years ago, and it has now been thoroughly revised.

Much new matter has been introduced, and some of the old re-arranged.

With the valuable assistance of my friend Mr. J. L. Johnston, late Principal Inspector of Customs Laboratories, the Alcohol Table has been completely re-cast, and is now, I believe, as nearly perfect as it is possible to make it. The Articles on Wines and on House-Drainage and the Orphanage Diet Table are quite new ; and other alterations will be found, which I hope will make the book more worthy of the favourable reception it has already received.

84 Harley Street.

May, 1872.

PREFACE TO FOURTH EDITION.

MY "Manual of Diet and Regimen" which appeared in 1864 having run through two editions in its first year, I published a third and revised edition in January, 1865. This has long been out of print, and, as the demand for the Manual did not decrease, I have been repeatedly urged to prepare a fourth edition. After many delays, from the interruption of other professional work, I have, at last, re-written the book, adding much new matter and incorporating several contributions, which I have published from time to time, on subjects relating to the preservation of health. I hope it will be found that I have thus materially increased the usefulness of the work without adding inconveniently to its length. My object and endeavour has been to produce a small book founded upon accurate scientific data but essentially practical: a book from which a doctor may refresh his memory, and at the same time one which he may safely place in the hands of his patients, to enlighten them on some of those important points which ought to be understood by the non-professional, and to teach them how vast and intricate is the science and art of rational medicine. Thus, to

make them more intelligent patients, and in so doing to remove some of the doctor's difficulties in healing them when they are sick, and when they are well to strengthen his hands in the preservation of their health.

It gives me great pleasure to be able to renew the thanks I expressed in 1864 to my friend Mr. Farrants, at that time President of the Microscopical Society, for the valuable assistance I have so frequently received from his remarkable analytical and arithmetical talents.

84 Harley Street.

May, 1870.

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ON
DIET, REGIMEN,
&c., &c.

PRELIMINARY REMARKS.

THE INTERDEPENDENCE OF DISEASES—NARROW SPECIALITIES AND BROAD DEPARTMENTS IN THE PRACTICE OF MEDICINE—NORMAL DIET—ERRORS IN DIET—THE DIET OF DISEASE—FOOD, HEAT, AND MOTION—GETTING FAT AND GETTING THIN—ALCOHOL, ITS PROPER PLACE IN DIET—REGIMEN—THE REGULATION OF HABITS—HOUSE-DRAINAGE—IMPORTANCE OF SLEEP—PROPER HOURS FOR MEALS—DISINFECTION—PSEUDO-MEDICAL DOGMAS, ALLOPATHY, HYDROPATHY, HOMŒOPATHY, KINESIPATHY—RATIONAL MEDICINE.

IN the practice of Rational Medicine, there are many subjects upon which the wise Physician is always glad to find that his patient has some knowledge as well as himself. Among these I know of none more important than the interdependence of Diseases and the principles of Diet and Regimen.

There are few medical questions which so test the depth and extent of a doctor's acquirements as THE INTERDEPENDENCE OF DISEASES—by which I mean, the way in which one disease leads to another, substitutes another, aggravates, or relieves another; the way in which disease appearing at one part of the body, depends upon the derangement of another part, perhaps distantly separated; the way in which disease of one kind in an ancestor, leads

to disease of several different kinds in the descendants; the way in which one general morbid cause may produce different effects upon different persons, according to the conditions of health in which they happen to be at the time; and numberless other similar phenomena.

These are matters of the highest importance in the right management and treatment of disease, yet they are so little understood, that the pains taken by a conscientious doctor in their investigation are not appreciated by the majority of persons. Thus it is that patients so often fail to discriminate between the wisdom of the man who will not prescribe for a part of the body until he has learnt the condition of the whole, and the *ad captandum* ignorance of another man who will prescribe unhesitatingly for a disorder of the whole body without previously ascertaining whether it depends upon disease of a part.

The chief objection to *specialities* in medical practice is the danger, that the doctor who treats but one part of the body may lose sight of the interdependence of diseases. This must always be a grave objection to very *narrow* specialities, but it does not apply to the broad division of the practice of medicine into *Departments*—that is to say, such a reasonable application of the principles of the “division of labour” as shall enable each practitioner, not only to completely master the department of Medicine which he selects for special study, but to advance the general knowledge of the profession by his investigations and experience.

For example, diseases of the ear are often dependent upon, or are connected with, diseases of other parts of the body; and the doctor who confines his practice to diseases of the ear may be in danger of losing sight of the broad facts of medicine, and in attempting to cure the ear may damage the body; but by extending his practice to all the

organs of special sense, which might fairly form a *department of Medicine*, he would be obliged to take in a range of observation and thought which would enforce a knowledge of the interdependence of diseases.

Again—Diseases of the heart and arteries are intimately connected with those of the lungs and throat; diseases of the lungs with those of the heart, arteries, and windpipe; diseases of the brain with those of the lungs, heart, and arteries; and all of these are often inseparably connected, in the relation of cause or effect with affections of the stomach, liver, pancreas, kidneys, intestinal glands, etc., etc. Therefore, for a doctor to limit his practice to diseases of the heart, to diseases of the throat, to diseases of the lungs, or to diseases of the windpipe, is to constitute a *speciality so narrow* that he is in danger of losing sight of the great principles of medicine. If, on the other hand, he selects for special study and practice such a broad department as Diseases of the Chest—that is to say, of all the respiratory and circulatory organs, and the associated processes of digestion and assimilation—he will be obliged to take in a range of observation and thought necessitating a constant remembrance of the interdependence of diseases, and he will be competent to deal with all classes of disease as well as those peculiar to his own department. I have instanced Diseases of the Chest because it is one of most important “lines” of practice, and the one with which I am most intimately associated, but the same remarks apply to Obstetrics, to Fevers, to the Diseases of Children, and to other large divisions of medicine. Thus *departments* of medical practice may be wisely selected by different medical men for special study—but *narrow specialities* are dangerous and objectionable, unless those who confine themselves to them are content to act simply as the assistants of the more general physicians

and surgeons, which is not likely to be the case. (See Part II., "ON THE INTERDEPENDENCE AND PREVENTION OF DISEASES AND THE DIMINUTION OF THEIR FATALITY.")

DIET is so little understood that, very often, those are the best off who abstain from all attempts to meddle with it and are content to follow the dictates of their instinct. This, of course, ought not to be the case, for diet, properly understood, may be made a powerful agent in the restoration and maintenance of health; and errors of diet are at all times capable of becoming serious causes of disease.

But, unfortunately, interference with diet, like all good things, is particularly open to abuse, for nothing is easier than to lay down a complicated code of restrictions and rules as to "what to eat, drink, and avoid" and the patient is very apt to think that the skill of the doctor increases with the number and variety of his orders. But those who understand the principles of diet know that the reverse is much nearer to the truth, and that learning and skill in dieting a patient, are shown by the wisdom with which the doctor, *instead of meddling with unimportant details*, seizes upon the few essential points on which the vice or virtue of a diet will generally be found to turn. Thus, in a case of diabetes (See Diet for Diabetes, Chapter IV.), the ignorant intermeddler may order fifty restrictions without doing his patient the slightest good; whereas, the doctor who understands the nature of the disease and the principles of diet, will speedily relieve his sufferings by telling him to take whatever he likes, so long as he touches nothing which contains starch or sugar. Thus, again, I have often seen patients suffering from acid dyspepsia who have been ordered and forbidden so many different articles of food that their lives were rendered miserable, without the slightest relief to their complaint, whereas, by forbidding them to take cheese and malt

liquor—the chief factors of their malady—and allowing them to eat and drink whatever else they pleased, their sufferings have been speedily removed and their lives made enjoyable.

It is absolutely necessary that he who ventures to interfere with a person's diet should first understand the principles upon which the food of health is regulated in nature; and nothing assists the intelligent doctor more in getting his orders carried out, than for his patient, as well as himself, to be acquainted with this subject. Ignorance and stupidity are the constant obstacles in the proper regulation of these matters. To elucidate this part of the subject, I have drawn up a brief statement of the "*Essentials of a normal diet.*" (See Chapter III.) This is illustrated by a set of tables, showing the method by which diets may be arranged so that they shall equally well support the human body in a state of normal health and strength, whether they consist of a complicated list of expensive articles, or, of no more than Bread, Cheese, Butter, Cresses and Water. In addition to this, I have introduced a Chapter "*on the wholesomeness and digestibility of various articles of food.*" (Chapter III.)

The advances of science have, of late, thrown most important light upon the connection between FOOD and FORCE, a subject of the greatest interest to all, whether medical or not; for, as we all take food and all desire to be strong, we are unavoidably fascinated by the inquiry what kind of food will give us the greatest amount of force. I have, therefore, introduced a short Chapter "*On Food, Heat and Motion.*" (Chapter II.)

The question of "*getting fat or getting thin,*" whether in health or disease, is one inseparable from the subject of food and force, for we have discovered that heat is but a mode of motion,* and that those elements of food capable

* See Prof. Tyndall's Lectures: *Heat a Mode of Motion.*

of liberating the largest amount of heat, may be utilised as accumulators of fat by economising the motion and heat of the body, and *vice versa*. In the Chapter "*On Food, Heat and Motion*," I have introduced a table, shewing the composition of some of the most important articles of food, and the amount of heat to be got out of equal quantities of each, and I have also stated the amount of mechanical force equivalent to a given quantity of heat. In order to elucidate the importance of fat, and the subject of getting fat or losing fat by alterations of diet, I have introduced some remarks on "*Bantingism*," on the means which promote the accumulation of fat, and on the importance of distinguishing between solid and liquid fat. (See Chapter V.)

From what I have already said, and from the articles referred to, it must be clear that nothing can take precedence of proper food among the means for the preservation of the public health; and when health is lost, whether by unavoidable disease or by other causes, nothing can be more important than to understand the leading principles which should guide us in altering the food to meet the conditions of disease, and thus to convert *diet* into a powerful instrument for the restoration of health. This is a subject which could not be fully discussed in a small work like the present, but in Chapter IV., "*On some Principles of Diet in Disease*," I have given some rules for the regulation of the food in various diseases, illustrated by Diet Tables for Consumption and Diabetes.

The subject of ALCOHOL, which has of late years occupied so much attention, both in the scientific and in the religious world, and which has been so grievously misrepresented and misunderstood, is now placed upon a more reasonable footing, some plain facts having been unquestionably established by the dispassionate investigations of

practical and scientific men. In this country we are particularly indebted to Dr. Anstie and Dr. Parkes for their investigations on this subject. (See Appendix I. and II.)

It is now quite certain, as I have long maintained, that alcohol is food—that is to say, that it is consumed in the body by a process of oxidation similar to that which other kinds of food undergo, that during its combustion force is liberated, and the demand for other kinds of food diminished. Alcohol, therefore, is able to save the combustion of the elements of tissue formation, by vicarious oxidation of itself.

It is quite certain that alcohol is one of the most readily oxidisable substances capable of being introduced into the animal organism. In this consists its chief value and its chief danger; for, on the one hand, it is able to replenish the lamp of life with so little tax upon the digestive functions and with so little loss of time, that nothing can take its place *when these are the desiderata* of most urgent import. But, on the other hand, this extraordinary facility for oxidation makes the presence of alcohol in the system a most dangerous impediment to the combustion of those less readily oxidisable matters, the full and regular combustion of which is absolutely essential to the continuance of normal health.

It is quite certain that alcohol is not an indispensable article of daily food; a normal diet may be perfectly well constructed without it, and a healthy person, under favourable circumstances, can live without it, just in fact, as the lower animals do. But it is also quite certain that alcohol is a most blessed gift of Providence, when rightly understood and wisely used. It is the endowment of man with those higher attributes which principally distinguish him from the brutes, that constitutes the element in his

nature which has made it necessary to his welfare that Providence should give him this peculiar article of food, in addition to all those placed within the reach of the less intellectual animals.

Thus it is a fact, that while man is brutalized by the *abuse* of alcohol, its proper *use* is one of his distinctions from the brutes.

Alcohol may perhaps be best described as a *Medicinal Food*. It is essentially a poison, although in its proper use it is an indispensable element in the life and happiness of highly civilized society. But it ought always to be regarded as a most treacherous friend.

I have drawn up an "*alcohol table*," (see Chap. VI.), the result of many careful analyses of each article so as to present a fair average result, from which it can be seen, at a glance, what quantity by measure of each of the ordinary fermented liquors represents one ounce by weight of absolute alcohol. The table includes a statement of the proportion of carbon, and of some other matters, contained in fermented liquors, besides the alcohol. But it must always be remembered that different kinds of fermented liquors represent many other influences for good or evil, in a dietetic point of view, in addition to those possessed by the alcohol, all of which require consideration in selecting the particular beverage suitable to any given case. I have therefore devoted some pages to a consideration of the general and special properties of fermented liquors. (See Chapter VI.)

It will be observed that I have omitted alcohol from all the *Tables of Normal Diet*, leaving it to be added in any form and quantity that circumstances may render most advisable. According to my own experience, based upon long and careful observation, an average-sized adult man taking moderate exercise may drink with advantage

enough fermented liquors, each 24 hours, to represent from one to two ounces avoirdupois of *absolute* alcohol*—provided it be always diluted to the extent of 10 fluid ounces (half-a-pint imperial) of water or some other unfermented liquor to each ounce avoirdupois of *absolute* alcohol, and that it be taken when there is food in the stomach. (See Chapter III.)

REGIMEN, or the regulation of habits, could not be fully discussed without involving physiological and other details which would have far over-run the limits of this book. I have, therefore contented myself with laying down, as concisely as possible, such rules as my own experience, added to that of others, has taught me are most necessary and most suitable to the generality of persons. They must, of course, be modified to suit peculiar constitutions, idiosyncrasies, and other circumstances, and to meet the various conditions of disease. In connection with these RULES FOR MAINTAINING VIGOROUS HEALTH, I have introduced an article "*on the Importance of Proper Hours for Meals*," also a number of valuable suggestions "*on House Drainage*," for which I am indebted to an experienced architect, (see Chapter I.) On the subject of exercise and training, in addition to the rules I have laid down, I advise everyone to read "*A System of Physical Education*," by Archibald Maclaren, of the Gymnasium, Oxford, an admirable treatise issued from the Clarendon Press.

As a necessary part of a work like the present, having for its object the preservation of health, I have added a chapter (Chapter VII.) on *Disinfection*, with rules for preventing the spread of the "Catching Diseases." It

* It will be seen by the *resumé* of Dr. Parkes' and Count Wollowicz' recent experiments (see appendix) that their results confirm the opinion at which I had long before arrived, by a different process.

is one of the opprobria of the present day that these diseases are so culpably propagated by the negligence of the heads of families to insist upon precautions, now well known to be capable of preventing contagion and infection. And in Chapter VIII. will be found some *special directions* for the sick room.

In concluding these preliminary remarks I must not lose the opportunity of expressing my opinion upon a matter regarding which there is great misapprehension, and, I regret to say, intentional misrepresentation. I refer to the subject of *pseudo-medical-dogmas*, such as are involved in the terms Allopathy, Hydropathy, Homœopathy, Kinesipathy, &c., and in such expressions as “a stimulating system,” “a depleting system,” “*similia similibus curantur*,” “*contraria contrariis curantur*,” and the like.

I disclaim them all, and I feel sure that in this statement I express the sentiment of the majority of thinking medical men. It is utterly unworthy of the professor of a science and art so great as medicine, to “pin himself” to such narrow dogmas and rules of thought and practice as are indicated by one and all of these expressions.

The practice of RATIONAL MEDICINE—having for its subject not only that most complex and wonderful fabric the animal organism, but that organism endowed with all those attributes which place man but “a little lower than the angels”—demands that there shall not be anything excluded from its service, and that every science and every art shall combine, at its bidding, to assuage the suffering and to save the life of Nature’s highest earthly creature.

Every honest and intelligent practitioner of rational medicine knows, that there are remedies of unquestionable

potency the action of which could never have been discovered by any such dogmas as "*contraria contrariis curantur*" or "*similia similibus curantur*." On the other hand, he knows that there are remedies the action of which may *appear* to be explained by one or other of these principles, but that the more intimately we become acquainted with the occult properties of medicines and the occult physiology of diseases, the more plainly do we see that these apparent explanations of the *modus operandi* of remedies are absurdly superficial and incorrect. He will not, then, refuse to benefit his patient by the use of the one remedy because he cannot explain its action, or of the other because it appears to act by similarity, or of a third because he thinks it acts by contrariety. Again, he knows that the same disease may assume such different phases, in different constitutions, at different times and in different places that in one case it may require "stimulation," in another "depletion," that at one period of the same case, "water treatment" may be advisable, at another "gymnastic," at another "mechanical," at another "climatic." And he claims these, and all other means beneficially placed within our reach which can protect health or benefit the sick, as the legitimate weapons in the armoury of rational medicine.

Every theory, every system, every dogma, must give place, at last, before the fact, *once unquestionably proved*, that such or such a remedy is best for such or such an occasion.

Therefore, in my opinion, all men who "pin their faith" on narrow dogmas, stamp themselves thereby as unfit for the practice of RATIONAL MEDICINE.

PART I.

CHAPTER I.

RULES FOR PROMOTING AND MAINTAINING VIGOROUS HEALTH IN ADULTS LIVING IN THE CLIMATE OF THE UNITED KINGDOM.

VENTILATION AND HEATING—GAS—HOUSE-DRAINAGE—CLOTHING
AND PROTECTION FROM COLD—SLEEP—EXERCISE—POSTURE
—BATHING—REGULATION OF THE BOWELS—REST AND
CHANGE—SMOKING—MEALS—PROPER HOURS FOR MEALS—
AFTERNOON TEA.

. These Rules will require to be modified by the medical man to suit special cases.

VENTILATION AND HEATING.

No sitting or sleeping room should be left long without a fire, and every room in which persons live, either by day or by night, should have some opening by which it communicates directly with the outer air; but this should be so arranged that no draught can fall upon the persons in the room.

If several rooms are occupied by turns during the twenty-four hours, the temperature of any one should not differ greatly from that of the rest.

No draught should blow upon a bed, and during sleep the whole body should have one covering at least of woollen material; for, while it is very important to keep the air of sleeping rooms fresh, it must be remembered that the body is more susceptible to chills during sleep

than waking, and that changes in the temperature of the outer air are especially apt to occur during the night, and are, therefore, in danger of producing chills before they are observed. (See Sleep).

All arrangements for ventilation must be based upon the following facts:—

The rate of respiration in an average sized adult man is about 16 times per minute, and each such respiration vitiates about 1 cubic foot of normal atmospheric air; so that each adult man vitiates 960 cubic feet of air per hour, and consequently will require a supply of fresh air at that rate; or in round numbers 1000 cubic feet per hour.

This supply of fresh air can be provided by observing the following conditions:—

A current of air travelling at the rate of 36 linear inches per second is not perceptible as a draught, and at that rate of movement $1\frac{1}{4}$ cubic feet per minute or 75 per hour will be admitted by an aperture of 1 square inch sectional area, communicating directly with the outer air.

If, therefore, an apartment is provided with an aperture having a ratio of 1 square inch sectional area to each 75 feet of cubic capacity, the whole air of the apartment will be changed once per hour.

Supposing, then, that the cubic capacity of an apartment is in the proportion of 1000 feet to each person in it, the requisite supply of fresh air may be obtained, without draught, through an aperture of from 13 to 14 square inches sectional area to each 1000 feet of cubic capacity.

But if the cubic capacity of the apartment is only in the proportion of 500 feet for each person in it, the air must be changed twice per hour in order to supply the requisite 1000 cubic feet of fresh air for each person.

When gas is burnt in an apartment the following facts must be borne in mind, in addition to the foregoing, for the purposes of ventilation:—

One cubic foot of ordinary London coal gas produces, in burning, 2-thirds of a cubic foot of carbonic acid, about the amount produced per hour by the respiration of one adult man,—and as an ordinary fish-tail gas-burner consumes about 3 cubic feet of gas per hour, it produces in that time as much carbonic acid as the respiration of three adults. In addition to this there are various highly injurious emanations from the burning gas.

HOUSE-DRAINAGE.

The following valuable practical suggestions from an experienced architect, (G. E. PRITCHETT, F.S.A., F.R.I.B.A.,) I give in his own words, as conveyed in a letter to me.

Architects have opportunities where other persons have not of observing the action of drains; the evil consequences of their misconstruction; of their too frequent proximity to wells of drinking water through additions and alterations of buildings, or otherwise; of soakage from cesspools; of evaporation of water from so-called "traps," &c. The opportunities referred to must therefore be my apology for venturing to address you on this subject, and you are quite at liberty to make use of the hints in this paper if they are likely to be of any service to the community.

I will commence, then, my observations by the somewhat startling and unpleasant enquiry which should be put to every householder, "Where are your drains and cesspools situated?" This is a question very closely linked with the preservation of life and health as you are

aware; yet, on this enquiry being made, many tenants at once admit, that they do not know, that they have no idea; that they have been in the house many years and are only aware, perhaps, of one drain from the scullery-sink which drips into a ditch or pond, or public sewer; that their fathers added a wing to the house, containing a large dining and drawing room, that there is at times a faint smell in these rooms, and the same unaccountable smell when a few friends visit them and when the shutters and curtains are drawn and good fires kept up; that the ladies are constantly troubled with headache, nausea, and lassitude; that the children are feverish at times, and death among them is not unknown! Could these householders only see the old brick barrel-drain and the foetid cesspool, with its outlet cut off perhaps, inclosed in this wing, and the rats and insects working their holes in it a very little distance below the unventilated floors, they would get out of the house as quickly as their legs could carry them.

If premises which have been added to from time to time are pulled down, and especially where a faint smell has been noticed, you may be greatly astonished to find a barrel-drain crossing the house, cut through or broken in before reaching the cesspool or outlet, and a mass of decomposing matter extending a considerable distance under the floors of the rooms, in consequence of the drain being stopped. This occurred without the knowledge of an unfortunate householder who at times perceived a faint smell, but having got used to it disregarded it: having, however, lost a valuable life in the death of the mother of his young family, and having carried some of his children to her grave, he determined to pull down the rooms and build more airy ones, little thinking what he should discover. It was in this case the want of quality in the air more than of quantity that caused his losses.

My object in mentioning such cases is to rouse every householder to trace his drains to their outlets, let him see that they are clear and that they have no holes in them, and that they are laid to a good fall.

If premises are your own do not mind spending a few pounds. If necessary take out the barrel-drains and put in socket-pipes, truly and well laid on concrete, covered with concrete and jointed in cement, this will keep out rats and vermin and worms, and prevent noxious gases collecting under your floors.

If your floors are not ventilated, see if this cannot be done.

If you are about to purchase or hire a nice-looking newly-built house, do not for a moment suppose or take for granted that the drains are "all right," for in many new houses the drainage is only run out a little way from the walls and not led anywhere, but left for someone to complete after his family has been struck down, and who upon digging up his flower-beds and destroying the growth of his shrubs and everything else, in pursuit of the drains, finds that they are choked, and full of worms and black stuff, and go nowhere.

Whether you occupy an old or a new house and premises, caution is equally necessary. Look at all your surface-gratings, whether in your paths, your stable-yard, your conservatories, porches, lobbies, or wherever they may be, with great suspicion, especially in dry weather. People will sometimes say to themselves when walking about premises, "wherever does that smell come from?" little thinking that the water has evaporated from the traps. These surface drains should not be connected with sewer drains at all, but should have a separate service of pipes.

See where the rain-water descending pipes run to, look

well at the joints of these vertical pipes. If you notice discoloration of the paint at the joints, you may know at once that they are connected with some cesspool or sewer-piping: *e.g.* a gentleman had low fever among his children, he could not assign any particular cause for it; one of the rain-water pipes, however, ran up the walls of his house, within a couple of feet of the nursery windows, this pipe was painted stone colour, the paint at and above the unstopped joints in this pipe was turned to lead colour. The question as to where the water from that pipe went to was put to him, and answered by "nobody knows." On examining, it was found (as might have been conjectured) to go into an hermetically sealed cesspool. Every time rain fell and water went into this cesspool, the sewer gas found its way readily through the joints of this pipe, and as the nursery windows were kept open as much as possible after the rooms were warmed by the young life in them, there is very little doubt where the source or origin of the enteric fever was lurking.

As rain-water is valuable, have an underground tank to receive it, and an overflow pipe to it, separate from any sewer drain. Let the rain-water pass through a small filter-chamber, filled with shingle and charcoal, before entering the tank: this will take out flakes of soot and particles of leaves and vegetable matter, the water will then keep better.

If you wish to know what size to make such a tank ascertain how many square yards of ground your roofs cover. About one hundred and twenty-six gallons of rain-water fall on an average every year upon a square yard of ground: a cubic foot of water is equal to about $6\frac{1}{4}$ gallons, you can therefore easily judge what size to make your tank.

Touching upon soil pipes and cesspools in private

houses where there are no public drains, I would say that too much care cannot be taken to provide for circulation of air in all pipes leading to and from cesspools. Connect these pipes with a 4-inch tube and carry it up higher than your chimneys on some stout lofty tree, or on some building only a short distance from the house, if possible, and towards the south of the house—as such air generally works towards the sun—and away from the house, if let out south of it.

For your water-closets you will find a good D trap about the best check to any pressure of sewer-gas, as it will not be forced through a D trap so easily as through some of the modern shallow traps and syphons; but if you happen to have valve-closets, or light traps, a lead pipe can in most cases be put into the leaden bend and carried above the roof; then you will have an essential safeguard. *e.g.*, it will be evident to all that when water goes down a soil-pipe a certain quantity of air must be displaced, this air will rush out into the closet unless ample provision is made for its escape elsewhere; and as the act of a person pulling up a closet handle is first, to stoop, which causes him to emit his breath, and then to raise himself which causes him to inspire, it will be readily noticed that he is sure to take in his breath at the moment when the water runs down the soil-pipe and the pent-up sewer gas rushes out close to his lungs. Keep the closet seat-flap down, cut holes in the flap to admit of the handle being raised when the flap is closed; it will, however, be far better to ventilate your soil-pipes and drains. Water-closets should be flushed with a large pail-full of water now and then, because the small quantity of water coming in through the supply-pipe into the pan is insufficient for this purpose, especially when the handle is held up a very short time. Jennings's and Underhay's pans are

better supplied with water than many, but even with these arrangements no sufficient flush takes place to well push on the excreta. When these accumulate, ammoniacal and other matters are formed and danger springs up, but there is not the same danger (if any) from fresh sewage. Do not allow slops to be emptied down your water-closets because some may be spilt and get between the seat and the pan, and gradually saturate the wood-work beneath, causing decay and unwholesome faint smells. Have a pad of dry hair-felt sewn in an oilskin cover placed between the top of the pan and the wooden seat if there is any vacant space there; this will stop draught and the splash referred to.

Lime-white with hot lime the floor and inside of the seat-enclosure annually; this can be readily done by taking off the top or seat.

The effectual ventilation of water-closets situated as they often are, is by no means an easy matter. If you open the window, the warm house will quickly receive the smell you intended to go outside, and you will soon perceive that the air will not obey your commands. Have a space (however small) between the inner and outer doors of the water-closet; if this space is too confined for a window get external air into it by tubes, this stratum of air will materially assist you, because it tends to balance and check the progress of the air in the water-closet beyond; but the better method is to lead a tube from the ceiling of the water-closet into the nearest chimney flue where there is smoke ascending, or where there is sufficient warmth to make it act as you wish; your water-closet will then soon be cleared of all disagreeables, a valve however, should be balanced in this tube to prevent any sudden down draft.

Some provision should be made for disposing of slops

entirely away from the water-closet. People are little aware what odd things are put down water-closets. If plumbers told people the queer things they find in water-closet pipes they would not be believed. Water-closets should be strictly guarded, and domestic servants cautioned against misusing them. The same oversight should be given to traps in sinks and elsewhere; these traps are often lifted off and not put on again, resulting in much damage to the health of the servants and all the inmates of the house. Let all pipes from sinks, butler's pantries, baths, &c., discharge themselves free to the air before entering sewer drains: this plan can generally be carried out without difficulty or unsightliness.

Have all junctions of water-closet pipes with the drains examined now and then, as the stopping often shrinks and the lead decays, especially if the stopping is made of Portland cement. The seating or fixing of the pan on to the soil-pipe should also be examined periodically so as to stop any leakage of sewer gas.

All cisterns should be cleaned out once a year, and any deposit removed. If you have a "waste-pipe" in your cistern branched into the soil-pipe, which is too frequently the case, look well to it, for unless your drains are sufficiently ventilated, the sewer gas will be forced through the waste-pipe and may be absorbed by the water in your cistern. If you have a painted lid to your cistern see if any discolouration has taken place; if you find such to be the case you may be sure that sewer gas has escaped into your cistern.

If you have drains from your basements and cellars be particularly careful to see that the traps are efficient and kept well supplied with water; the great importance of having this seen to is self-evident. Where do you suppose the supply of air to your sitting-rooms is frequently

drawn from? if they happen to be over rooms or cellars with plastered ceilings, air will percolate from these into your sitting-rooms. You can prove this by blowing a cloud of tobacco-smoke below; or you may find it out accidentally through something being spilt, such as paraffin oil for instance. Have your cellars frequently limewhited and the floors cleaned.

I will only slightly touch upon wells and drinking-water because it is impossible to exhaust such an important and interesting subject in a letter, but I do wish to observe, that every householder should know exactly where his well is situated, if he has one.

People are little aware how soon drinking water is spoilt by a small leakage of surface-water, or drain-water into it, *e.g.*, an additional drain is thought desirable, an ordinary bricklayer is sent for, who puts it in for you, not knowing that your well is in close proximity to it, or if he knows its situation you are not informed of it; the consequence may be and often is most disastrous. Cases such as this are common through persons hiring houses (on a lease for instance) and who like to see the premises dry quickly after rain; they do not know and do not trouble themselves to ascertain where their wells are; but have extra drains put in without thought; their drinking water is spoilt; the sequel is too certain and the evil often only found out when too late.

To effectually deal with the sewage of large towns so as to remove, and actually to convey away noxious matters from our very midst without the use of the present water system is a great difficulty, and the prospect of any radical change of the present system in London, for instance, seems an impossibility, on account of the gigantic network of sewers already provided and in use.

Nevertheless, I will proceed to mention a few grave ob-

jections with the hope of an amelioration of some of them, by better attention to details in respect to the more efficient ventilation of sewers and the prevention of the ingress of evil-smelling, if not of poisonous, gases into our houses. The worst form of sewer-gas is generally formed and found in the side drains, or branches, which are led up to our houses, and the contents of these are all but stagnant when the main sewers are filling. Remove, therefore, where possible, all inlets into the drains leading to the sewers from the interior of your houses. But it may be said that in the majority of cases this cannot be done without destroying the drainage altogether; the answer is, such cases are, comparatively speaking, few. Take drains from cellars for instance, how seldom they are of real service compared with the great danger of their presence. Cellars can be cleaned down without necessitating a trap and drain into the sewer. Deal with the cleansing of a cellar-floor the same as is done with a boarded floor, by wiping up the water and drying the floor as well as may be.

Asphalte is very good for cellar floors, and very cleanly. Nasty traps in your cellars and basement, containing in themselves a quantity of stagnant dirty water communicating with the sewer, the gas in which can easily be forced into your house, is a grave form of evil. To cure this source of disease, simply dispense with the traps and drains and wipe your floors clean. By some thought and contrivance it will be found that very many connections with the sewers can be avoided.

Waste pipes, again, in cisterns connected with the soil-pipe and sewer should be dispensed with, and means to prevent occasional overflows of water when the badly fitting common ball-taps stick, should be provided for in another direction. Waste-pipes in cisterns connected with

sewer drains are out-spoken examples of the stupidity, which, with an utter disregard to sanitary laws, persists in such suicidal arrangements. Surely there is great inconsistency in raising alarms about the impurity of London water, whilst at the same time it is not unfrequently contaminated with a poison through the waste pipes in cisterns which no filter can remove. Where connection with the sewers is actually necessary (as in water-closets) ventilate the soil-pipe by a vertical continuation of it to such a height as circumstances will permit.

Water-closets should not be in the midst of our houses at all, but projected outwards with a lobby or anteroom, as before alluded to ; but it is quite surprising how few junctions with the sewer drains in houses are absolutely necessary. Every internal junction dispensed with is a step in the right direction ; get all connections, where possible, outside your houses, because sewer-gas forced out into the open air is soon robbed of its noxious powers, but its escape into the interior of your house is as bad as a murderer entering it. A very sly insidious felon is sewer-gas !

The dry earth system is most excellent and effective, but the cost of bringing dry earth round and removing that used in populous places would be heavy, and the intrusion and inconvenience apparently great ; time however will show whether this system cannot be developed without such drawbacks. Moule's dry-earth system is most in use. Goux's absorbent closet system is equally effective, having been tried and adopted for the North camp at Aldershot, and even in so large a town as Halifax.

Dry earth commodes, also, for sick chambers are very useful.

As compared with the water-closet system, the earth

closet has several advantages. It is cheaper in its original cost, it requires less repair, it is not injured by frost, it is not liable to damage through hard substances being thrown into it, it greatly diminishes the quantity of water required by each household. My own experience is in favour of the earth system, if carried out under proper authorities. It is deserving of every consideration, but its merits at present are not sufficiently understood by the public to interfere much with the poisoned water system. Formidable sums of money are being spent in draining towns *so as to lay on sewer-gas by means of pipes to our very bedroom doors*. Is this right? Will not the water system be superseded?

Cleanliness, after all, is the great natural disinfectant; look well, therefore, to all sources of water-supply, impure water-butts, sinks, and particularly dust-bins; remove frequently all possible sources of nuisance and accumulations of impurities; also, last but not least, get rid of any damp mouldy paper-hangings and the festering paste behind them, if you have any such sources of fever on your premises.

There is an important lesson to be learnt by all of us. Every householder should make himself acquainted with so much of sanitary science as will enable him to preserve the health of his family. To secure health, sanitary laws must be understood and carried out. A family cut down by preventable sickness cannot be considered a fortunate one, and it is just as necessary to learn something of sanitary laws to provide against this, as it is to provide the common necessities of life.

CLOTHING.

In winter, the body and limbs, from the root of the neck to the toes and elbows, should be covered, next the skin, with some woollen material, such as lamb's wool or flannel.

In summer, the material may be lighter, as merino, and need not cover the limbs.

The same woollen dress should not be worn both night and day, but should be changed for a woollen sleeping *vest* of the same material as that worn during the day. (See Sleep).

Having provided that the skin is so covered that it is protected against sudden changes of temperature, all other clothing should be limited to that which is sufficient to preserve a comfortable feeling of warmth under the different changes of the season and of the weather.

Over-clothing, *i.e.*, such as keeps the body perspiring while at rest or produces perspiration under very slight exertion, should be avoided, especially over-clothing of any one part of the body by which it is kept hotter than the other parts.

It is of the greatest importance to keep the feet dry and as warm as the rest of the body. If the weather is damp, this can only be done by wearing goloshes when out of doors. (See Bathing).

A careful analysis, made by me, of a large number of cases of WINTER COUGH, CATARRH, BRONCHITIS, EMPHYSEMA, ASTHMA, showed that fresh colds were the only causes which brought on or aggravated the cough in 72 per cent. of the cases, and the most frequent and potent causes of these fresh colds, as stated by the patients themselves, were:—

1. Sudden changes of temperature in 21 per cent.
2. Fogs and damp air in 19 per cent.
3. Draughts of cold air in 16 per cent.
4. Cold winds in 10 per cent.
5. Getting wet in 14 per cent.

6. Wet feet in 17 per cent. And the same list of causes of fresh colds were found to be the potent provokers of *short breathing*. This important list is no less striking for the powers for evil which it is shown to possess, than for the remarkable simplicity of the evil powers themselves.

If, then, these unfortunate sufferers from *Winter Cough* could have been protected from sudden changes of temperature, fogs, mists, cold winds, draughts, wet feet, and wet coats and dresses, 72 per cent. would have kept free from their coughs. It would seem strange if we could not find means of protection against such common-place influences. In truth, there is no deficiency of means of protection against them, and it is because of the very common-place character of these means of protection and of the influences themselves that both are so much neglected and under-valued.

But 72 per cent. of the cases of *Winter Cough* which I analysed might probably have been prevented by attention to these common-place things. Let us then give a few minutes to their consideration.

1. Sudden changes of temperature. This is the most difficult to avoid of any on the list. The occupations and amusements of all classes involve such changes, and we cannot stop these occupations and amusements, even were it desirable to do so. The workshop, the counting house, the committee-room, the opera-house, the ball-room, must be warm when the outer air is cold, and changes from one to the other cannot be avoided. But very much can be

done to prevent the body from feeling these changes. The first and most important is the complete envelopment of the body and limbs in wool next the skin, thus interposing a bad conductor of heat between the surface of the body and the outer air. It is surprising that, even at the present day, this simple and common-sense protection is neglected by so large a number of persons both of the educated and of the uneducated classes. It is not sufficient for the purpose in view that a little body-vest should be worn just big enough to cover the thorax and abdomen, leaving the extremities unprotected. It should be insisted on by medical men that the arms and legs require to be protected from sudden transitions of temperature as well as the trunk.

In fashionable life the greatest practical difficulty we have to encounter is the question of exposing the necks and shoulders of ladies in evening dress. It is useless to order body-clothing of wool to the throat, and to expect that ladies will give up a fashion which has been followed and thought charming in all countries and all ages. The difficulty is however, to be got over pretty well. Every lady in evening dress should carry with her, as invariably as she does her pocket handkerchief, a Shetland shawl or a mantilla of wool or fur, of a size and shape to cover all those parts not protected by woollen underclothing, and it should only be removed while actually within warm rooms and should be kept at hand to be replaced on passing through passages, or if the rooms become cold, or if sitting in draughts.

The main source of protection, then, against sudden changes of temperature to the surface of the body, is to be found in a complete covering of wool next the skin. But besides this, much greater attention, than is common, should be paid to putting on and taking off complete and

efficient over-clothing when going from hot to cold and from cold to hot temperatures. This is particularly neglected by the working classes and by girls and boys at school.

What I have said with regard to sudden changes of temperature will apply equally to two other causes of fresh colds on our list, viz., draughts of cold air, and cold winds. Both are to be deprived of their sting by proper clothing of the skin and mucous orifices.

Getting wet, and wet feet occupy a very serious place in our list, and there is no doubt that *damp and cold* applied to the general surface is a most efficient means of producing chill and vital depression, with congestion of the internal organs. It is necessary that cold be combined with moisture to produce this effect.

Even if all the clothes on the body are wet, no harm will come so long as they are kept warm, and this suggests the very great value, to all persons liable to exposure to wet, of light waterproof over-alls. They may either be put on to keep the underclothing dry, or, if the underclothing has become wet, either by weather or by perspiration, they may be put on to prevent too rapid evaporation and consequent reduction of temperature, especially when the person is about to remain still after getting warm with exercise. In this variable climate, therefore, school girls, governesses, shop and factory girls, and all women whose occupations call upon them to brave the weather, ought to carry with them complete waterproof mantles made as light as possible, but extending from the neck to the ankles, which can be put on or not as required; and boys and men similarly exposed should carry waterproof over-alls.

But if wet and cold to the surface of the body is a fruitful source of catarrh, wet feet—which means wet and

cold feet—is a still more prolific source. There is no external influence which so surely produces congestion of the naso-pulmonary mucous membrane, as wet and cold to the soles of the feet. There is nothing so universally neglected, and yet there is nothing more easy to avoid. Warm socks, horsehair soles, goloshes, provide efficient protection against wet and cold feet. It does not seem to be half understood that, although a shoe or boot may not be wet through, if the sole is damp it will, by conduction and evaporation, most effectually carry away the heat from the sole of the foot, and, therefore, ought never to be worn after exercise is over.

We have still one item left on our list—viz., Fogs and Damp air, which were the things most inclined to make the breath short in 24 per cent. of the cases, and the most potent causes of fresh colds in 19 per cent. I have particularly remarked, that although the smoke and other irritating matters constituting fog are unquestionably very injurious, it is the moisture and cold of the fog which are the qualities most potent for mischief to the naso-pulmonary tract. There is but one means of depriving a fog or mist of its injurious properties, and that is a respirator; and the same may be said of the changes of temperature of which I spoke just now; a respirator is the only means of protecting the respiratory passages from the effects of transitions of temperature.

Although it is quite proper to cover the neck and throat lightly, I am decidedly of opinion that *warm* wrappers round the neck are objectionable; they produce congestion of the nasal and faucial mucous membrane and thus dispose to the very complaints they are supposed to prevent. (See the Author's "*Lectures on Winter Cough, Catarrh, Bronchitis, Emphysema, Asthma*," delivered at the Royal Hospital for Diseases of the Chest, 3rd edit. Churchill).

I am glad to find the use of respirators, which I have so long advocated, recently demonstrated in one of Professor Tyndall's beautiful lectures. (See appendix III.)

SLEEP.

During ordinary health, the hours spent in actual sleep should not exceed eight; and if the sleep is sound, continuous and refreshing, six will be sufficient for many persons. (See Rest and Change). It is of great importance, especially with the young and the weak, to maintain the due proportion between the number of waking and sleeping hours. If, therefore, it is necessary, as in going to places of amusement, to sit up unusually late, the waking hours, thus spent, should be compensated by a similar number of sleeping hours, *taken in the preceding day*; so that over-fatigue may be prevented. For example, if the usual hour for rising is 8 and for bed 11 and it is proposed to stay up till 3, the hour for rising should be changed to 12; or 4 hours rest should be taken at some other time during the day.

During sleep, it is equally important to keep the body pleasantly warm, and to avoid keeping it overheated; and, as serious changes in the weather may happen in the night, and the lowest temperature in the twenty-four hours naturally occurs between 2 o'clock and 6 o'clock a.m., the ventilation and clothing must be prepared for these contingencies. (See Ventilation, and Clothing).

If sleep is taken after meals, it should not exceed half an hour in duration; it should be taken sitting back

in an easy chair, with the head supported behind ; not lying down, and not sitting with the chin resting on the breast ; the feet should be kept warm, and the dress loose round the neck and waist.

Every precaution should be taken to secure quiet sleeping-rooms.

EXERCISE.

During ordinary health, some part of every day ought to be spent out of doors ; and in ill-health it is of great importance not to discontinue the observance of this rule without good reason ; for, although *in certain states of disease it may be very important to remain in-doors*, it must not be forgotten that proper clothing, goloshes, respirators, and umbrellas, may make it not only safe but advantageous to go out of doors for exercise, when, without them, it would be very injurious. (See Posture).

Out-of-door exercise should be as active as the strength will allow, and should always be continued up to the point of slight—but not over—fatigue. This will be the best measure of the proper amount for both the weak and the strong.

Unless the air is pure, and the person strong, exercise before breakfast is more likely to do harm than good ; a tumbler of milk and a biscuit, however, will be a sufficient meal to take before the walk or ride—a more substantial breakfast being taken afterwards. (See Meals).

* Especial care is needed not to expose the body to chills when heated by exercise ; and cold drinks should

not be taken at that time, unless the exercise is about to be continued immediately; and even then the quantity of cold drink taken at once should be very small. (See Meals).

In his work "ON PHYSICAL EDUCATION," already referred to, Mr. Maclaren makes the following excellent remarks:

"Such in brief is Exercise, such the ends which it accomplishes, and such the manner of their accomplishment; viz. the *destruction* of the tissues, the hastening of the decay and death of every part coming within its influence; but also the speedy removal of all waste, the hastening forward of fresh material for its replacement; and in doing this it attains three distinct but co-relative results.

"1. It increases the size and power of the voluntary muscles employed.

"2. It increases the functional capacity of the involuntary muscles employed.

"3. It promotes the health and strength of the whole body, by increasing respiration and quickening circulation."

"It is *health* rather than strength that is the great requirement of modern men at modern occupations; it is not the power to travel great distances, carry great burdens, lift great weights, or overcome great material obstructions; it is simply that condition of body and that amount of vital capacity, which will enable each man in his place to pursue his calling, and work on in his working life, with the greatest amount of comfort to himself and usefulness to his fellow men.... Let it not be inferred from this that I consider health and strength as in any manner opposed to each other, on the contrary, they are most intimately allied and are, usually, by the

same means and by the same manner obtained; very closely are they connected but they are not the same, and a man may possess either without the other.".....A most important principle in Exercise, and one which should ever be borne in mind, is, that it should be regulated by individual fitness; for the exercise that scarcely amounts to exertion in one person will be injurious and dangerous to another, and not only is this inequality observable among different individuals, but, the same individual may have parts of his body possessing special power or presenting special weakness. A man may have limbs capable of transporting him at the rate of four miles an hour throughout the day, and for many days in succession, but with heart or lungs all unequal to the effort. Or he may have an organization so frail and a temperament so susceptible to stimulation or excitement, that the one is an abiding danger to the other."

When there is no heart or lung disease to interfere, there is no form of gymnastic exercise, so generally efficient as "skipping backwards."

POSTURE.

It is of great importance to acquire a habit of drawing the breath deeply and slowly, so as to expand the lungs freely during ordinary breathing. This requires that the head and shoulders be thrown well back in walking, sitting, and standing, and that no clothing be worn tight round the ribs. Those engaged in sedentary or stooping occupations should especially attend to this advice.*

* See Appendix V. "On the importance and dangers of Rest in Consumption."

Those whose occupation obliges them to maintain the erect posture for a number of hours each day, should take every opportunity of lying flat down, even if only for a few minutes at a time. They should also bear in mind that standing will not take the place of walking exercise. (See Exercise).

All persons whose pursuits require the long continuance or frequent assumption of any particular position or movement of the body or limbs, should take every opportunity of changing it for an opposite position or movement. (See Rest and Change, and Sleep).*

BATHING.

Warm baths, Turkish baths, vapour baths, shower baths, and cold plunges, should only be used under special medical orders.

During ordinary health, the skin of the body and limbs should be smartly rubbed, once in twenty-four hours, first with a rough towel wet with cold water, and then with a dry one till in a glow. The bather should stand on a dry rug while using this "*cold friction bath*," and it should not last more than one or two minutes, including both the wet and the dry rub. Salt may be advantageously added to the water; and the bath may be used either on rising or going to bed, according to the feelings and convenience of each individual. When water cannot be borne cold, it must not be used tepid, but very hot.—The momentary application of very hot water to the

* For "Gymnastics" see Mr. Maclaren's "System of Physical Education," already quoted. For effects of unhealthy posture, see Mr. Heather Bigg's "Orthopraxy."

skin, immediately followed by a brisk friction, will produce a direct-action glow nearly approaching the re-action glow following the application of cold.

If the weather is very cold or the person delicate and chilly, the upper half of the body should be uncovered and rubbed first, and then a woollen vest should be put on and the lower half uncovered and rubbed.

It is well to accustom the feet to being washed in cold water, but it must be done cautiously at first, and they should never be kept in the water more than a few seconds.

It is obvious, that there are times when cold bathing of all kinds must be temporarily discontinued.



REGULATION OF THE BOWELS.

As a general rule, the bowels ought to act, at some stated time, once in the twenty-four hours; and it is best to accustom them to act in the morning, after breakfast.

If they do not act spontaneously, they should be assisted by some wholesome article of diet which is found to affect them; or by some harmless aperient medicine, which must be prescribed by a medical man, to suit the particular case; for the best aperient for one person may be the worst for another.

Provided that an aperient medicine is suited to the case, contains no drug injurious to the general health, and is not taken oftener than every second night, there is no harm in taking it at bedtime, whenever the bowels have not acted satisfactorily during the day.

REST AND CHANGE.

Active life is essential to the health of body and mind ; but both require periods of rest, in addition to the regular hours of sleep. It is much better, therefore, to work vigorously for a time and then to rest, than to keep up a monotonous round of lifeless drudgery. (See Sleep, and Exercise).

The "current of the thoughts" is to the mind what posture is to the body ; and both require change to prevent weariness and deformity. (See Posture).

Rest of body or mind may be obtained either by abstaining from all bodily or mental exercise, or by change of occupation, and as the one gives entire rest and the other only partial rest, it is best to adopt each of these measures at different times.

It must be remembered, that as the mind acts by means of the brain, which is a part of the body, it cannot act healthfully while the body is suffering under disease or exhaustion. The "*gait*" of the mind is affected by the condition of the brain ; as much as the "*gait*" of the body is affected by the condition of the limbs.

SMOKING.

A certain number of persons have a peculiar susceptibility to the poisonous influence of Tobacco, and they should never touch it. But for the majority of adults a moderate amount of smoking does not appear to have any seriously deleterious influence, and in many it acts as a useful antidote to brain-worry.

A careful and extended examination of the influence of Tobacco on the health of individuals and communities, gave the following results. (*Social Science Review*, July 11, 1863).

“1. The effects that result from smoking are due to different agents imbibed by the smoker: viz., carbonic acid, ammonia, nicotine, a volatile empyreumatic substance, and a bitter extract. The more common effects are traceable to the carbonic acid and ammonia; the rarer and more severe to the nicotine, the empyreumatic substance, and the extract.

“2. The effects produced are very transitory, the poisons finding a ready exit from the body.

“3. All the evils of smoking are functional in character, and no confirmed smoker can ever be said, so long as he indulges in the habit, to be well; it does not follow, however, that he is becoming the subject of organic and fatal disease because he smokes.

“4. Smoking produces disturbances:—(a) In the *blood*, causing undue fluidity, and change in the red corpuscles: (b.) on the *stomach*, giving rise to debility, nausea, and in extreme cases, sickness: (c) on the *heart*, producing debility of that organ, and irregular action: (d) on the *organs of sense*, causing in the extreme degree dilatation of the pupils of the eye, confusion of vision, bright lines, luminous specks, and long retention of images on the retina; with other and analogous symptoms affecting the ear, viz., inability clearly to define sounds, and the annoyance of a sharp ringing sound like a whistle or a bell: (e) on the *brain*, suspending the waste of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted: (f) on the *nervous filaments and sympathetic or organic nerves*, leading to deficient power in them, and to over secretion in those surfaces—glands—over

which the nerves exert a controlling force: (*g*) on the *mucous membrane* of the mouth, causing enlargement and soreness of the tonsils—smoker's sore throat—redness, dryness, and occasional peeling off of the membrane, and either unnatural firmness and contraction, or sponginess of the gums: (*h*) on the BRONCHIAL SURFACE OF THE LUNGS when that is already irritable, sustaining the irritation, and increasing the cough.

“5. The statements to the effect that tobacco smoke causes specific diseases, such as insanity, epilepsy, St. Vitus' dance, apoplexy, organic disease of the heart, cancer and consumption, have been made without any sufficient evidence or reference to facts; all such statements are devoid of truth, and can never accomplish the object which those who propose them have in view.

“6. As the human body is maintained alive and in full vigour by its capacity, within certain well-defined limits, to absorb and apply oxygen; as the process of oxydation is most active and most required in those periods of life when the structures of the body are attaining their full development; and as tobacco smoke possesses the power of arresting such oxydation, the habit of smoking is most deleterious to the young, causing in them impairment of growth, premature manhood, and physical degradation. . . . “Taking it all in all, stripping from the argument the puerilities and exaggerations of those who claim to be the professed antagonists of the practice, it is fair to say, that, in the main, smoking is a luxury which any nation, of natural habits, would be better without. The luxury is not directly fatal to life, but its use conveys to the mind of the man who looks upon it calmly, the unmistakeable idea, of physical degradation. I do not hesitate to say that if a community of youths of both sexes, whose progenitors were finely formed and powerful, were to be

trained to the early practice of smoking, and if marriage were to be confined to the smokers, an apparently new and a physically inferior race of men and women would be bred up. Of course such an experiment is impossible as we live: for many of our fathers do not smoke, and scarcely any of our mothers, and thus, to the credit of our women, chiefly, be it said, the integrity of the race is fairly preserved: with increasing knowledge we may hope that the same integrity will be further sustained: but still, the fact of what tobacco can do in its extreme action is not the less to be forgotten, for many evils are maintained because their full and worst effects are hidden from the sight. . . .

“If I were equally fair for tobacco as against it, I should be forced to give it a place as one of the least hurtful of luxuries. It is on this ground, in fact, that tobacco holds so firm a position:—that of nearly every luxury it is the least injurious.”

MEALS.

Counting from the time of beginning one meal to that of beginning the next, food should be taken at regular intervals of from four to five hours; except the interval between dinner and a very slight tea, which may be reduced to two or three hours. In weakly persons, and when the appetite will allow only a very small meal to be taken at one time, the intervals between all the meals may be reduced to from three to four hours. In illness, the interval must be ordered day by day by the medical man.

The chief meal of the day—the full meal—by what-

ever name it is called, should be taken at whatever hour active occupation, both bodily and mental, can be suspended for about two hours; provided always that not less than two hours elapse between the conclusion of the full meal and bedtime.

Breakfast should be the second best meal of the day, and should be taken leisurely immediately after rising in the morning. (See Exercise).

The other meals should be taken punctually at the fixed hours, but should be only light refreshments, and small in bulk.

No food should be taken in the intervals between the regular meals.

As a general rule, pure water may be taken at any time, if indicated by thirst, so that the body is not heated by exercise, and the quantity drunk at once does not exceed a quarter of a pint. (See Exercise).

Spirituous liquors should not be taken the first thing in the morning or the last thing at night, without medical orders, they should not be taken when the stomach is empty, and they should not be drunk stronger than in the proportion of one ounce avoirdupois of absolute alcohol in about ten fluid ounces of liquid. (See Alcohol Table.)

One of the principal sources of mischief in the use of alcoholic liquors is the practice of taking them to quench thirst in the place of unfermented drinks. *The sense of thirst is a call from the organism for water, not for alcohol.* Let the alcohol be taken as food, as medicine, or as a luxury, but not to quench thirst in the place of those unfermented liquors which are essential to health as diluents and solvents. (See Alcohol Table; Remarks on Alcohol in "Preliminary Remarks;" Chapter VI.; and Appendix).

ALCOHOL FASTS.—Those who habitually take alcohol daily, should abstain from it entirely for a few days twice or thrice a year.

PROPER HOURS FOR MEALS.

Substance of a letter by the Author addressed to employers of labour, and printed for private circulation, 1852.

. That animal life cannot go on in even passable health and comfort without sufficient food and effectual digestion, is a fact perfectly familiar to all; yet, unhappily, among those who live an in-door life, effectual digestion is scarcely ever known. They constitute the bulk of that enormous number of persons who suffer from what is popularly known as “indigestion.”

Now, there can be no question that they are pre-disposed to this class of diseases by many circumstances, quite inseparable from their occupations. But that makes it the more desirable to avoid all those causes of disease which are not necessary to their pursuits.

. I am not speaking of any *particular form* of indigestion, but in a general and broad sense, of all those various maladies classed under the popular term.

The choice of the hours at which clerks, shopmen, mechanics, labourers, and other business-servants of both sexes take their meals, depends almost entirely upon the decision of their superiors.

If these hours are not well chosen, indigestion, in some form, is the certain consequence sooner or later. And it will be seen from the few plain facts which I shall detail, that the notions which have long prevailed as to the proper hours for taking food, and consequently the regu-

lations of nearly all business establishments, in this respect, are inconsistent with the conditions which physiology teaches us to be essential to healthy digestion, with the requirements of the various occupations by which servants gain their livelihood, and with the conventional arrangements of society in the present day.

I shall hope, by avoiding all technicalities and minute physiological details, and by employing the plainest popular terms, to make my meaning perfectly intelligible to the unprofessional, to whom, in this instance, it is necessary to address my remarks; and I now ask particular attention to the following statement of the conditions necessary to healthy digestion.

1. Food of appropriate quality and bulk.

2. In the case of a *full meal*,—rest of body and tranquillity of mind for a short time previous to taking food, and for at least an hour afterwards. In the case of a *light meal*,—gentle exercise, and moderate mental activity may be allowed with impunity.

3. Effectual mastication, by which the alimentary matter is completely disintegrated and saturated with saliva, and the meal taken slowly.

4. A sufficient interval between any two meals, to allow the first to have been digested and removed from the stomach, long enough for the digestive functions to regain their full vigour, before the second is introduced. The period which should intervene will depend upon the rapidity of digestion, which may vary according to the quantity eaten, the state of the health, the nature and amount of the previous exercise, the condition of the mind, and many other circumstances.

5. Caution that the stomach is not left empty long enough for the system to become exhausted, and the digestive powers thereby weakened.

6. Strict adherence to the same hours for taking food, that the stomach may acquire a habit of preparing for its reception.

7. An interval between the last meal and bedtime, sufficient to allow the work of digestion to be concluded before lying down to sleep.

Many other conditions might be mentioned, but as the few main points already stated are enough for our present purpose, I shall confine myself to them.

The circumstances under which the majority of those persons are placed, whose health we are principally considering, must now be reviewed, in order to compare them with the conditions essential to healthy digestion, and to draw the necessary conclusions as to the PROPER HOURS FOR MEALS.

From the factory artisan up to the banker's or merchant's clerk, several important circumstances are common to all.

1. The day is devoted to labour either of the body or of the mind, or of both.

2. Business must be continued unremittingly up to the moment of leaving for meals, and resumed immediately on returning from them.

3. The time which can be spared for meals during business hours, must necessarily be very limited.

4. Some portion of this short time must be occupied in repairing to, and returning from the refreshment place.

In many instances, especially in retail trades, the nature of the business renders it impossible to keep to fixed times for those meals taken during working hours.

The fact of taking time for meals out of the middle of the day, necessarily makes it later in the evening before the business can be finished; and this not only to the extent of the time during which work is actually stopped;

for we all know how much the progress of business is interrupted by the simple acts of discontinuing and recommencing it, more especially when books and calculations are concerned. The effects of these combined circumstances may be viewed daily by visiting the public dining rooms attended by clerks, the lodgings of labourers at their dinner hour, and the offices and factories before and after meal-time—dinner-time more particularly, and dinner being the principal meal in the day—the *full meal*—it is of it that I shall chiefly speak.

Twelve, one and two o'clock seem to be the national dining hours for the working classes, and sixty minutes the maximum time allowed from business for this chief meal. The hour having arrived, books or tools are hastily laid aside, and the dining place is reached by a sharp walk, which adds to the bodily fatigue of the labourer, and is not long enough or sufficiently leisurely to rest the brain of the accountant. The dinner must be despatched hurriedly, or there will not be time for the artizan to smoke his pipe, or for the clerk to glance at *The Times*; or perhaps the reading and eating are carried on at once. Mastication is carelessly performed, the mind is kept occupied, and the stomach rapidly loaded with food before it has had time to make ready for it; and, in some cases a larger quantity is taken than the stomach has power to dispose of, simply because it is introduced too expeditiously for the system to become acquainted, as it were, that the supply of its wants is being effected. The meal finished, and the paper glanced at, or the pipe smoked, the sharp walk must be repeated, now with a full stomach, and business resumed before digestion has had time even to commence: and at this period, when the organic energies ought to be all concentrated about the stomach, they are at once summoned to the brain or to the muscular

system. Consequently, the meal remains imperfectly digested, or not digested at all, lingers in the stomach beyond its proper time, and is finally expelled in an unnatural condition, unfitted to undergo the important changes necessary before it can be appropriated for healthy nutrition. In all probability the next meal is introduced before the former one has entirely left the stomach, and thus the mischief is increased. Comparing the circumstances, here briefly enumerated, with those essential to healthy digestion, laid down before, the antagonism, so evident between them, plainly shows that "Dyspepsia," or difficult digestion, is only the natural consequence of so persistent a disregard of the laws of health.

I am aware that different businesses do, from their nature, present various obstacles in the way of carrying out such sanitary measures as are most desirable, and that one set of rules will not always be practicable in two establishments. Therefore, I should advise that the few principal conditions of healthy digestion before mentioned be carefully borne in mind; and that in each establishment the hours for meals be so selected, that these conditions and the calls of business may be arranged in unison with each other.

For a considerable period of time, during which my attention has been more particularly directed to this subject, I have made extensive inquiries on points connected with it, among employers and their servants, and have also had sufficient opportunities of enforcing the better regulation of meals upon both classes, with effects so decidedly beneficial, that I can with confidence impress the importance of the alterations I propose, and I am convinced of their general practicability. After this experience and a mature consideration of the subject

scientifically, I beg leave to call attention to those regulations, which appear to me to afford the nearest approach to the healthy standard that can be practicably arranged to meet the necessary obligations of business establishments in general.*

Let me assume that a substantial breakfast has been taken soon after rising, and a short space of time allowed to elapse between the meal and the commencement of active business:—(in those cases where the hour for business is very early, the breakfast should be divided, the fast being broken by a light fluid meal, and a second light meal taken some hours after). But to return to the better plan. Breakfast having been taken, and the day's employment commenced, the arrangements are now under the direction of the employer. *From this moment until labour, whether mental or bodily, has ceased, no FULL-meal should be allowed.* This is to be considered the FIRST GOLDEN RULE. The SECOND is not less important—that some *light refectio*n should be taken punctually every four or five hours. By adhering to the first rule, the system will never be charged with the task of active digestion at times when it is amply engaged in other functions; the digestive organs will not be injured by being called upon to undertake what they cannot properly perform; while the servant will not suffer from that oppressive languor and inertia, so unavoidable after a full meal, and will be so much the better fitted for his duties. By the second rule the system is maintained in a state of energy; the light refreshment, being easily digested during bodily or mental activity, supports the strength much more than a full but ill-digested and unassimilated meal can possibly do, and leaves the stomach itself unwearied, in a state of

* This was written twenty-three years ago and subsequent experience has amply proved the value of the rules laid down.

healthy vigour when the hour of relaxation from business arrives. Even in weak persons, a light meal will almost invariably have quitted the stomach in four or at most five hours, and in the strong considerably sooner than this; at intervals of four or five hours, therefore, according to the strength of the individual and the rapidity of his digestion, the stomach will be preparing for fresh work, and will call for it by the return of appetite, which must not on any account be disregarded. And in this place I must again impress THE SERIOUS IMPORTANCE TO HEALTH, OF NOT NEGLECTING THESE OCCASIONAL REFRESHMENTS DURING BUSINESS.

The day's labour over, the objections to taking a full meal are at an end, provided the second golden rule has been observed; and the amount of refreshment, necessary to repair the wear and tear of the day's exertions, may now be taken with decided advantage. I must here remind both employers and employed, that rest of mind and of body are necessary for a short time *before* taking a meal. To those who have been mentally occupied with sedentary business, a short leisurely walk will be a very proper prelude to dinner; but to those whose physical powers have been taxed during the day, there should be a short period of perfect rest before commencing the chief meal. It is a habit too common among commercial men to return home, impatient for their dinners, and to commence eating immediately, while in a fatigued condition. I have, in many instances, induced such persons to lie down for a quarter of an hour before beginning their meal; and have seen so much benefit arise from this practice, that I can confidently recommend it to all who are actively engaged during the day. When the dinner is finished, one hour at least should be devoted to mental and physical tranquillity—some leisurely amusement being

preferable to sleep. (See Sleep, Chap. I.) When the meal has not exceeded the bounds of moderation, a sufficient quantity of gastric fluid for the digestion of the whole will generally be secreted within this period of rest; after which, the same quantity of blood and nervous energy being no longer required by the stomach, some more active employment of the mind or body may be indulged in, and all will go on well.

The full meal of the day, then—the dinner—should, under ordinary circumstances, be taken between the hours of five and seven p.m., which will allow time for it to be entirely disposed of before the hour of sleep arrives; and as the whole night passes without refreshment, a light refection such as our national “tea,” is very desirable about three or four hours after dinner. These arrangements will be found perfectly consistent with the essential conditions of healthy digestion; and, with a little contrivance and modification of hours in particular instances, are practicable in the majority of large establishments. And here let the friends of “early closing” observe, that by doing away with the injurious mid-day dinner, there will be so much saving of time in the best part of the day, and consequently a better opportunity of concluding business earlier in the evening.

It remains for me briefly to point out some of the inconsistencies of the system now most popular among dyspeptics and those employed in business. The dinner being taken at one or two o'clock must necessarily be a hurried one; it is impossible in the middle of business to allow time for rest, before or after the meal, to any serviceable extent: the evil consequences of this, in a large number of instances, have been already referred to. The “tea” being taken between five and seven o'clock, can only be a light meal, for the stomach does not require more so soon

after dinner, therefore there is but one alternative, to leave the system without substantial nourishment from two o'clock p.m., until breakfast next day, or to take another meal just before bed-time : of the two the latter would be the better, if the supper could be limited to a very moderate refection ; but after waiting from an early dinner until nine or ten o'clock in the evening, a person in health has too good an appetite to be contented with this ; therefore the stomach is loaded at a time when it cannot empty itself properly before the hour of sleep ; the disadvantages of which are too familiar to need repeating here. Any one, therefore, who is anxious to regulate his diet according to the *popular ideas of what is healthy*, finds himself in this dilemma. He believes it to be an essential point that he should dine at an early hour. He knows that rest before meals, eating them slowly, and rest after them, are all necessary to proper digestion. He also knows perfectly well that, in the middle of the day, his business will not allow him either the rest or the leisurely dinner. Supper he is convinced is a most unwholesome meal, yet he knows from sore experience, that to fast from his early "tea" until next morning, leaves him too exhausted to sleep comfortably, to rise with vigour, or to enjoy breakfast. At length, if he reason at all, it becomes clear to him that to do what he thinks right in one respect, he must do wrong in another—a sufficient proof that there is error in the whole system.

AFTERNOON TEA.

Some remark is necessary in reference to the now prevalent custom, among the upper classes, of dining very late

and taking an afternoon tea. Unless cautiously arranged it is apt to lead to dyspepsia. The rule should be that the tea should precede the dinner by three hours, and not come sooner after lunch than three hours, assuming the lunch to have been a good meal; and if any tea or coffee is taken after dinner it ought to be immediately after, so as to constitute part of the same meal, and to partake in the same process of digestion. It is most injurious to take tea or coffee from one to two hours after dinner or any other full meal. Finally, on going to bed, or about four hours after dinner, a tumbler of water should be drunk to clean the stomach of the debris of the last meal. This will promote a refreshing sleep and a clean mouth in the morning.

CHAPTER II.

FOOD, HEAT, AND MOTION.

A FOOT-POUND, A FOOT-TON, A BRITISH UNIT OF HEAT—MECHANICAL-EQUIVALENT OF A BRITISH UNIT OF HEAT—COMBUSTION OF CARBON, CONSUMPTION OF OXYGEN, EVOLUTION OF HEAT—MODE IN WHICH THE HEAT EVOLVED FROM FOOD IS DISPOSED OF—COMPOSITION OF SOME OF THE PRINCIPAL ARTICLES OF FOOD AND THEIR HEAT-EQUIVALENTS AND MECHANICAL EQUIVALENTS—WEIGHT AND COST OF FOOD COMPARED WITH WORK PRODUCED—USES OF NITROGENOUS AND NON-NITROGENOUS FOODS.

. See Essentials of a Normal Diet. Chapter III.

THE relation between food, heat, and mechanical force has been the subject of some of the most important investigations of late years, and the light which has been thrown upon it is one of the greatest steps in the progress of medical science. But so far as medical art and practice are concerned, very little application has yet been made of this advance in scientific knowledge. This is only what might be expected, considering the occult nature of the subject, and the scarcity of time among the great body of medical practitioners to master and familiarise themselves with the details of such departments of medical progress.

Nevertheless, it is high time that such facts as are at present known, and such applications of them as are at present possible, should be added to the common stock of knowledge possessed by practical medical men; for it is only in this way that the public can derive benefit from our advances in science.

For the purpose, therefore, of enabling practitioners easily to familiarise themselves with these matters, the following concise statement has been prepared:—

1. A *Foot-pound* is the amount of mechanical force required to raise a pound weight one foot.

2. A *British Unit of Heat* is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

3. This amount of heat (a British unit) may be converted into mechanical force sufficient to raise a pound weight 772 feet.

4. This amount of heat (a British unit) is generated by a pound weight falling through a space of 772 feet. Hence 772 foot-pounds is called the *Mechanical Equivalent* of a British unit of heat.

5. One ton weight is 2,240 lbs.; $\frac{772}{2240} = 0.34465$; therefore, the heat units multiplied by 0.34465, will always give the mechanical equivalent in *Foot-tons*.

6. The heat of combustion of carbon and hydrogen *fully oxidised* (to CO_2 and H_2O) is as follows:—

1 lb. $\left\{ \begin{array}{l} \text{C evolves } 14,500 \\ \text{H } ,, \quad 62,032 \end{array} \right\}$ British Units of Heat.

7. The total heat of combustion of a compound containing H and C is the sum of the quantities of heat which the C and H contained in it would produce separately by their combustion.

8. It has been found that the presence of *Hydrogen with Oxygen in the proportion to form water does not affect the total heat of combustion*. It is only the *excess of Hydrogen* that can be made serviceable as a source of available heat.

9. The mean consumption of oxygen by an adult man of average stature (weight 150 lbs.) taking ordinary exercise is about 30 ozs. avoirdupois in 24 hours, and the

heat evolved by each 1 oz. of oxygen in combining with carbon, hydrogen, etc., is about 340 British units. Hence, 10,000 British units of heat will be evolved every 24 hours by the combination of 30 ozs. of oxygen with carbon, hydrogen, etc.; therefore, the food of an adult man, under ordinary circumstances, should be such as may, in addition to other purposes, evolve at least 10,000 British units of heat.

10. Practical experience in the dieting of large numbers of men, and other means, have enabled us to establish the fact, that such an average man, as above described, requires, for the maintenance of health, a diet which shall contain about 4 ozs. of plastic materials, 3 ozs. of fat, and 10 ozs. of carbo-hydrates; and on careful analysis of this diet, we find that it can supply the required 10,000 British units of heat—viz., 2,516 from the plastic, 3,357 from the fat, and 4,150 from the carbo-hydrates; total, 10,023.

11. The mode in which these 10,000 British units of heat are disposed of, and the purposes which they serve, may be seen in the following calculation which has been made as nearly correct as possible. 8,000 British units are required as sensible heat,—to raise the temperature of the inspired air to the temperature of the body, to vaporise the pulmonary halitus, and to maintain animal heat. The mechanical equivalent of 2,000 British units (equal to 690 foot-tons) is expended in actual work, more than half of which is employed in internal vital work (the mechanical work of the heart alone is equivalent to 200 foot-tons; respiratory and other vital movements may be estimated as equivalent to nearly 200 foot-tons more), leaving about 290 foot-tons available for external work, which may be represented by the labour of walking 16 miles; but of course only so much is available for

actual walking, as is not used in the other external movements of the body, which we daily perform. (See Chapter IV.)

In the following table the conditions laid down in No. 6, 7, 8, of the foregoing paragraphs have been observed in calculating the British units of heat given in the last column but one, and the mechanical equivalent of the Heat-units given in the last column, has been calculated by the rule stated in paragraph 5.

The composition of the articles of food in this table will not be found to agree exactly with *any one* published analysis. 186 separate analyses by eminent chemists have been examined and compared for the purpose of fixing, as nearly as practicable, the approximate *mean* composition of each article.

ARTICLES OF FOOD.	Ozs. Avoiidu- pols.	Plastic.	Fat.	Saccharine.	Acid Gelatine, etc.	Complement.	Mineral.	Water.	N.	H.	O.	C.	British Units of Heat.	Mechanical Equivalent in foot tons.
Apple	1'000	002	—	136	100	022	—	839	—	009	072	058	53	18-26645
Bacon (dried)	1'000	084	625	—	—	—	005	286	013	078	078	540	754	259'86610
Bread	1'000	100	007	453	—	010	010	420	016	037	247	260	259	89'26435
Butter	1'000	010	860	—	—	—	010	120	002	100	083	685	968	333'62120
Cheese	1'000	308	256	024	—	—	047	365	049	053	108	378	495	170'60175
Egg	1'000	150	108	—	—	—	025	717	024	023	045	166	218	75'13370
Fig (dried)	1'000	050	009	570	—	150	034	187	008	044	329	248	236	81'33740
Fish (fresh)	1'000	166	008	—	—	—	029	797	026	013	039	096	118	40'66870
Flour (Wheat)	1'000	142	010	668	—	013	012	125	023	056	377	394	392	135'10280
Indian Corn Meal . . .	1'000	081	045	700	—	028	008	138	013	056	367	390	393	135'44745
Meat (Butcher's, cooked).	1'000	225	089	—	—	—	025	661	036	026	060	192	245	84'43925
Milk (new)	1'000	045	031	048	—	—	006	870	007	010	039	068	81	27'91665
Oatmeal	1'000	150	058	532	—	096	038	134	024	052	302	362	383	132'00095
Pea (dry)	1'000	219	015	469	—	133	035	137	028	048	283	337	354	122'00610
Pork (fresh)	1'000	175	160	—	—	022	022	643	028	031	055	221	293	100'98225
Potatoes	1'000	017	—	230	—	016	011	726	003	016	117	111	106	36'53290
Rice	1'000	051	004	817	—	033	005	090	008	057	414	393	376	129'4440
Suet	1'000	—	860	—	020	—	—	120	003	101	086	690	975	336'03375
Sugar (Loaf)	1'000	—	—	900	—	—	—	100	—	059	460	381	350	120'62750
Vegetables (fresh) . .	1'000	01	002	678	—	008	007	895	002	006	043	039	38	13'09070

Professor Frankland has determined the weight and cost of various alimentary articles that would be required to raise the body-weight of a person of 10 stone or 140 lbs. to a height of 10,000 feet, reckoning in accordance with Helmholtz's calculation, that the animal system is capable of turning one-fifth of the actual energy developed by the oxidation of the food to account as external work.

NAME OF FOOD.	Weight in lbs. required.	At price per lb.	Cost.
		s. d.	£ s. d.
Cod liver oil	0'553	3 6	1 11 $\frac{1}{4}$
Beef fat	0'555	10	5 $\frac{1}{2}$
Butter	0'693	1 6	1 0 $\frac{1}{2}$
Cocoa nibs	0'735	1 6	1 1 $\frac{1}{4}$
Cheshire Cheese	1'156	10	11 $\frac{1}{2}$
Oatmeal	1'281	2 $\frac{3}{4}$	3 $\frac{1}{2}$
Arrowroot	1'287	1 0	1 3 $\frac{1}{2}$
Flour	1'311	2 $\frac{3}{4}$	3 $\frac{1}{2}$
Pea-meal	1'335	3 $\frac{1}{4}$	4 $\frac{1}{2}$
Ground rice	1'341	4	5 $\frac{1}{2}$
Isinglass	1'377	16 0	1 2 0 $\frac{1}{2}$
Lump sugar	1'505	6	9
Commercial grape sugar . .	1'587	3 $\frac{1}{2}$	5 $\frac{1}{2}$
Hard-boiled eggs	2'209	6 $\frac{1}{2}$	1 2 $\frac{1}{2}$
Bread	2'345	2	4 $\frac{1}{4}$
Lean ham (boiled)	3'001	1 6	4 6
Mackerel	3'124	8	2 1
Lean beef	3'532	1 0	3 6 $\frac{1}{2}$
Lean veal	4'300	1 0	4 3 $\frac{1}{2}$
Potatoes	5'068	1	5 $\frac{1}{4}$
Whiting	6'369	1 4	9 4
Apples	7'815	1 $\frac{1}{2}$	11 $\frac{3}{4}$
Milk	8'021	5 per qt.	1 3 $\frac{1}{2}$
White of egg	8'745	6	4 4 $\frac{1}{2}$
Carrots	9'685	1 $\frac{1}{2}$	1 2 $\frac{1}{2}$
Cabbage	12'020	1	1 0 $\frac{1}{2}$
Guinness' Stout (bottled) .	6 $\frac{3}{4}$ bottles	10 per bottle	5 7 $\frac{1}{2}$
Bass' Pale ale (bottled) .	9 "	10 "	7 6

"Looked at in the manner above represented, muscular work, like heat, in opposition to Liebig's theory, is derivable from the oxidation of non-nitrogenous as well as nitrogenous matter, and Professor Frankland's tables show that 55 lbs. of fatty matter will furnish the same amount of power as is obtainable from 13 lbs. of flour, 15 lbs of sugar, 35 lbs. of lean beef, and 5 lbs. of pota-

toes. Traube even inverted the proposition of Liebig, and asserted in the most decided manner that the substances by the oxidation of which force is generated in the muscles are not the albuminous constituents of the tissues, but non-nitrogenous principles, viz., either fats or carbo-hydrates.

“According to the foregoing table, wherein is mentioned the cost of the various articles of food required to be consumed to accomplish a given amount of work, it appears, viewing these articles purely in their capacity as force-producing agents by oxidation, that the same amount of work, is obtainable from oatmeal costing $3\frac{1}{2}d.$; flour, $3\frac{3}{4}d.$; bread, $4\frac{3}{4}d.$; and beef fat, $5\frac{1}{2}d.$; as from beef costing $3s. 6\frac{1}{2}d.$; and isinglass $\text{£}1\ 2s. 0\frac{1}{2}d.$

“Taking all the facts as at present revealed into consideration, we appear to be warranted in adopting the following terms of expression. It is in the first place admitted on all hands that food is the source from which muscular power is derived, and hence the supply of food should be in proportion to the amount of work that is performed. It was formerly thought that food must be converted into muscular tissue before it could be available for the performance of work, which involved the origin of work from nitrogenous alimentary matter. The effect of recent investigation, however, is to show that it is not to an oxidation of muscular tissue that we are to look for the force produced. The muscles appear to stand in the position of instruments for effecting the conversion of the chemical energy evolved by the oxidation of combustible matter into working power. Fats and carbo-hydrates can furnish the combustible matter required, and, under ordinary circumstances, probably do largely, if not chiefly, supply it. Nitrogenous matter can do so likewise, but it has to undergo a preparatory metamor-

phosis for effecting the separation of nitrogen in a suitable form for elimination.

“As thus considered the non-nitrogenous alimentary principles appear to possess a higher dietetic value than the nitrogenous, and when regarded solely in relation to capacity for force production, there is no doubt they in reality do so. But there is a further point to be looked at. The physical development and maintenance of the body must be likewise taken into account, and for this it is nitrogenous alimentary matter only that can supply what is needed. Wherever vital operations are going on, there exists nitrogenous matter. It is, indeed, through the instrumentality of nitrogenous matter that the operations of life occur. The tissues which form the instrument of living action require to be constructed in the first instance; and next, to be constantly renovated, to compensate for the loss by deterioration which is continually going on. Thus, a demand for nitrogenous alimentary matter is created quite apart from direct contribution to force production; and, further, not only is nitrogenous matter required for the construction and repair of the tissues, but likewise to form a constituent of the secretions, for all secretions which possess active properties owe them to the presence of a nitrogenous principle. Here then is an additional demand for nitrogenous matter, and, it is to be remarked that as increased work leads to an increased development of the tissues employed and thereby an increased appropriation of nitrogenous matter, so it calls for an increased production of secretions in consequence of the larger amount of food that has to be prepared for consumption. In this way, theoretically; without contributing in a direct manner to force production, the performance of work may be looked upon as necessitating a proportionate supply of nitrogenous alimentary matter.

“Practically, it is found that hard work is best performed under a liberal supply of nitrogen-containing food. The reason probably is that it leads to a better nourished condition of the muscles and of the body generally. Under the use of animal food, which is characterised by its richness in nitrogenous matter, the muscles, it is affirmed, are observed to be firmer and richer in solid constituents than under subsistence upon food of a vegetable nature. . . . As albuminous food produces firm muscles, so exercise makes them red. To sum up, science intimates that a liberal supply of nitrogenous matter is necessary to produce and maintain muscles in a good condition for work, and the result of experience is to confirm it.

“I have been speaking of food considered in relation to the performance of work, but it would be unphilosophical to look at it only in this light. The question should be viewed under a broader aspect; and the point really for the physiologist to discuss is under what combination of alimentary principles the highest state of development, both mental and physical, is attainable. If regarded as living for the mere performance of work, and looked at economically, man, it may be said, would bear an unfavourable comparison with a machine set in motion by steam. Mechanical work is under no form so costly as under that produced by muscular agency, and particularly by that of man. It has been calculated, it is true, that whilst through the medium of the animal system, one-fifth of the power stored up in the food consumed is realisable as external mechanical work, the amount realisable from fuel is only one-tenth in the case of even the best constructed steam-engine, the remainder being dissipated or lost as heat. Thus far, the animal machine is more economical of its force than the machine of artificial con-

struction; but on the other hand, the fuel (food) consumed in the former is very much more costly than that consumed in the latter. From this consideration human labour can never compete in economy with steam, and hence, as suggested by Donders, the worse use to make of a man is to employ him exclusively in mechanical work—a proposition which harmonises with the increasing introduction of machinery in our advancing age of civilization. Letheby, (*Cantor Lectures on Food*) on the subject of the comparative costliness of food and fuel, says, ‘Taking a steam engine of one horse-power (that is a power of raising 33,000 lbs. a foot high per minute) it will require two horses in reality to do the same work for ten hours a day, or twenty-four men; and the cost would be 10*d.* for the steam engine, 8*s.* 4*d.* for the two horses, and just £2 sterling for the twenty-four men.’

“From what has preceded we may conclude that, with a supply of nitrogenous matter sufficient for the thorough development and subsequent maintenance of the body in good condition, the best materials for the production of working power, as well as heat, are the non-nitrogenous principles, and that of these the fats* are more effective than the others.” “*A Treatise on Food*,” &c., by F. W. Pavy, M.D., 1874.

* (See Fat, Chapter V.)

CHAPTER III.

NORMAL DIET.

ESSENTIALS OF A NORMAL DIET—MODE OF CONSTRUCTING DIETS
—EXPENSIVE DIETS AND CHEAP DIETS FOR MAINTAINING
HEALTH—TABLES AND ANALYSES—THE WHOLESOMENESS AND
DIGESTIBILITY OF VARIOUS ARTICLES OF FOOD—MODES OF
COOKING IN COMMON USE.

ESSENTIALS OF A NORMAL DIET.

(See Food, Heat, Motion).

A HEALTHY adult man of average stature taking moderate exercise, will require and can consume, daily, from 32 to 40 ounces avoirdupois of *dry* nutritious food, which should have the following characters:—

1. About $\frac{1}{200}$ must be mineral matter.
2. From $\frac{2}{6}$ to $\frac{1}{2}$ may be water,* leaving $\frac{3}{5}$ or not less than $\frac{1}{2}$ or from 15 to 20 ounces of anhydrous solid alimentary material.
3. Three or four ounces of plastic matter must be combined with three or four times that quantity of heat-giving material.
4. The heat-giving constituents must contain a mixture of fats (hydro-carbons) with saccharine materials (carbohydrates), in the proportion of about 1 of the former to 3 of the latter.
5. These heat-giving constituents should supply from 6

* (See table showing the quantities of water in various foods).

to 10 ounces of carbon, the exact amount required varying with season, exercise, etc.

6. The Articles of Food must be sufficiently varied to meet the requirements of the taste and of the appetite, and their Mechanical and other Conditions must be suited to the digestive powers of the stomach.

In addition to these characters, every complete diet must contain some potash-vegetable or fruit; and the total amount of water taken in 24 hours, *including that contained in the dry food*, must not be less than 70 ounces avoirdupois.

DIET TABLES FOR THE MAINTENANCE OF HEALTH IN ADULTS LIVING IN THE CLIMATE OF THE UNITED KINGDOM.

Each diet table contains all the essential elements of nutrition, in forms, quantities and proportions necessary to the maintenance of health. The tables have been made complete without Alcohol, leaving this to be ordered or not, according to circumstances. But, if fermented liquors are added to any diet table, the quantity of carbon which they contain must be borne in mind. (See Alcohol Table Chapter VI.)

It will be observed that the totals of the corresponding columns of the analyses are nearly the same in all the diet tables, showing the important fact that all the essentials of a normal diet may be equally secured in a diet that is simple and cheap and in one that is complicated and expensive.

In all diets Salt must be used and in those which do not include Potatoes some other Potash-vegetable or Fruit or Cresses or Lime or Lemon juice must be taken.

No. 1.

[illegible]

No. 2.

[illegible]

No. 5.

Liquid. fluid ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
	16	Bread . . .	6'72	1'60	'11	7'25	3'09
	3	Peas . . .	'41	'65	'04	1'40	'65
	4	Bacon . . .	1'14	'33	2'50	....	1'98
	2	Cheese . . .	'73	'61	'51	'05	'40
10		Milk . . .	6'94	'40	'28	'34	'36
20		Coffee . . .	19'71	....	....	'28	'13
	1	Sugar . . .	....	....	....	1'00	'42
35		Water . . .	35'00	....	....	....	....
63	26		70'65	3'59	3'44	10'32	7'03
In Plastic matter							1'94
Total							8'97

No. 6.

Liquid. fluid ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
40		Milk . . .	34'68	2'00	1'40	1'68	1'80
	4	Rice . . .	'36	'20	'02	3'26	1'46
	3	Eggs (two) . .	2'15	'45	'32	....	'26
	2½	Sugar . . .	....	....	....	2'50	1'05
	1	Butter . . .	....	....	1'00	....	'74
	9	Bread . . .	3'78	'90	'06	4'08	1'74
30		Water . . .	30'00	....	....	....	....
70	19½		70'97	3'55	2'80	11'52	7'05
In Plastic matter							1'92
Total							8'97

NORMAL DIET TABLES.

No. 7.

[illegible]

No. 8.

[illegible]

No. 9.

Liquid. fluid ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
	9	Flour . . .	1'13	1'28	'09	6'28	2'82
	1 $\frac{3}{4}$	Suet . . .	....	....	1'75	....	1'38
	3	Sugar . . .	....	....	....	3'00	1'26
	6	Eggs (four) . .	4'32	'88	'64	....	'52
27		Milk . . .	23'41	1'35	'94	1'13	1'21
42		Water . . .	42'00	....	....	....	....
69	19 $\frac{3}{4}$		70'86	3'51	3'42	10'41	7'19
In Plastic matter							1'89
Total							9'08

No. 10.

Liquid. fluid ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
	16	Oatmeal . . .	2'14	2'40	'93	8'51	4'46
22		Milk . . .	19'07	1'10	'77	'90	'99
	1 $\frac{1}{2}$	Butter . . .	....	....	1'75	....	1'30
		Sugar . . .	....	....	....	'75	'32
49		Water . . .	49'00	....	....	....	....
71	18 $\frac{1}{2}$		70'21	3'50	3'45	10'16	7'07
In Plastic matter							1'89
Total							8'96

No. 11.

Liquid. fluid ozs.	Dry. ozs.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
	25	Bread . . .	10'50	2'50	'17	11'33	4'82
	3 $\frac{1}{4}$	Cheese . . .	1'18	1'00	'83	'08	'65
	2	Butter . . .	....	....	2'00	....	1'48
60		Water . . .	60'00	....	....	....	....
60	30 $\frac{1}{4}$		71'68	3'50	3'00	11'41	6'95
In Plastic matter							1'89
Total							8'84

ORPHANAGE DIET TABLE.

The following diet table was arranged, with great regard for both economy and health, for a charitable institution, the inmates of which consisted of *children averaging about ten years of age*, who had all been taken from utterly destitute homes.

No. 12.

Liquid. fluid ozs.	Dry. ozs.	Food for 7 days .	This standard diet to be provided per head for all the children in the Asylum and whatever is not taken by those under 10 years of age to be allowed to those over 10.				
	16	Meat (cooked)	Chemical (approximate) composition <i>Per Day.</i>				
	122	Bread					
	2	Rice	Water.	Plastic.	Fat.	Saccha- rine.	Carbon.
	12	Potatoes					
	10	Suet Pudding (see recipe, Chap. VIII.)	fluid				
	5	Flour Pudding (see recipe, Chap. VIII.)	ozs.	ozs.	ozs.	ozs.	ozs.
	4	Cheese					
	2	Peas (dry)					
	4	Indian Corn Meal					
	½	Cocoa (dry)					
	3	Treacle					
	12	Green Vegetables					
	7	Dripping or Butter	65.00	3.37	2.07	10.50	6.05
80		Milk					
		Water (in addition to that contained in dry food.)	In Plastic matter . .				1.76
210			Total . .				7.81
290	199½						

The attention of those who visit the poor is requested to the following paragraph.

There is considerable difficulty in selecting diets for the very poor, which combine cheapness and simplicity with the essential chemical composition, in a form which the stomach will tolerate. But the two following will be found to fulfil all these conditions, so far as it is possible to do so without the introduction of meat; and in one of

them bread is given in the largest quantity consistent with health :—

No. 13.

Allowance for twenty-four hours: Bread, 25 oz.; cheese, 2 oz.; butter, suet, or dripping, 2 oz. These yield to analysis: plastic material, 3·1 oz.; fat, 2·3 oz.; saccharine material, 11·4 oz.

No. 14.

Allowance for twenty-four hours: oatmeal, 16 oz.; milk, $\frac{1}{2}$ pint; butter, suet, or dripping, 1 oz. These yield to analysis:—plastic material, 3·0 oz.; fat, 2·3 oz.; saccharine, 9·0 oz.

To each of these diets must be added limejuice or some land vegetable, salt, and a free supply of pure water.

The following table, constructed by Dr. Edward Smith, will shew the proportionate quantities of water which are present in various solid and liquid foods.

	Per Cent. of Water.		Per Cent. of Water.
Arrowroot	18	Parsnips	82
Barley flour	15	Pea meal	15
Beer and ale	91	Potatoes	75
Butter-milk	88	Poultry	74
Carrots	83	Pure butter and fat	15
Cheese	36	Rice	13
Cream	66	Rye meal	15
Dried bacon	15	Salmon	77
Eels	75	Skim cheese	44
Egg	74	Skim milk	88
Fat beef	51	Sugar	5
Fat mutton	53	Treacle	23
Fat pork	39	Tripe	68
Green bacon	24	Turnips	91
Indian meal	14	Veal	63
Lean beef	72	Wheaten bread	37
Lean mutton	72	Wheaten flour	15
New milk	86	White fish	78
Oatmeal	15	White of egg	78
Ox liver	74	Yolk of egg	78

THE WHOLESOMENESS AND DIGESTIBILITY OF VARIOUS ARTICLES OF FOOD.

BEEF AND MUTTON. A healthy stomach will generally digest either of these with ease, but a stronger digestive power as regards meat is required, as a rule, for beef than for mutton. There are exceptions to this, however, and much depends on the quality of the meat, some beef being easier of digestion than some mutton (assuming the cooking to be equally good in both cases). There are also peculiarities of stomach with regard to "flavours" which need consideration—and it will be found that, whereas the solid inside-meat of either beef or mutton can be digested easily, the stomach is "upset" if the more specially flavoured parts are eaten; and this will occur sometimes with mutton and not with beef, and *vice versa*. This remark applies to nearly all "flavoury" foods; it is partly explained by the fact that "flavours" are so often dependent upon volatile and empyreumatic oils, which are apt to regurgitate. But in the case of meats, when roasted, baked, fried, or grilled, the surface is apt to be over-done, and the action of the heat on the superficial fat produces acrid compounds, consisting of acrolein and fatty acids; and it is these which disagree although the meat itself may digest and agree. This difficulty does not occur with boiled meats. Another point, and one of great importance, which applies to all solid food, is the way in which it is cut up. It must be taken for granted that, with the best of teeth and the greatest care, portions of solid food will occasionally be swallowed imperfectly masticated, that is, not *converted into a pulp*; but when we consider how often teeth are defective and how carelessly people eat while talking, as a matter of fact, ill-masticated food is swallowed at every meal. Now nearly all the

difficulty may be avoided by a judicious mode of cutting up the food while eating. It must be remembered that the essential point to be obtained, is that the digestive juices in the stomach shall penetrate to the centre of every particle of food and this within a certain time, limited to a few hours at the outside. If the food is cut up into dice-like cubes it will often be impossible for the centre to be reached before the stomach has expended its digestive force, and thus a number of undigested particles will be left, either to encumber the stomach when it ought to be clean and ready to prepare for the next meal; or if they have passed out of the stomach, to call upon the second processes of digestion to attempt to do what ought to have been completed in the stomach; or to irritate the intestines by throwing into them an abnormal quantity of waste. The same thing occurs, though to a less extent, with meats and other foods when their tissue is *long-fibred* if they are cut in thick slices "the way of the grain." But if the food is thinly sliced "across the grain" every fibre is presented to the stomach juices in a thin section with both its ends exposed, and it is then quickly and easily saturated by the juices of the stomach, favoured by capillary attraction in the direction of the fibres. This is really the great secret in enabling the stomach to deal with solid food—**CUT EVERYTHING ACROSS THE GRAIN AND IN THIN SLICES.**

It must be remembered, however, that one object of mastication is insalivation, and no cutting up can entirely take the place of a sufficient mastication as far as insalivation is concerned. But this is of less importance with animal than with vegetable foods; and it so happens that the quickest eaters and worst masticators are those whose saliva is abundant and readily poured out; because a deficiency of saliva necessitates better mastication to render the

food moist enough to swallow. Advantage may be taken of this fact when people are inclined to swallow their food half masticated by giving it to them dry. In either case, the thin cross-grained slice will be most rapidly saturated with saliva and soonest fit for swallowing.

Another point of great importance, in facilitating the digestion of hard and solid substances, is the addition of a proper quantity of water to assist the stomach juices in dissolving them. Very few articles of food are soluble in alcohol and many are rendered less soluble by its presence. It is not sufficient, therefore, to drink alcohol with meals; a certain quantity of water must be taken whether alcohol is also taken or not. On the other hand, it is a mistake to deluge the stomach with fluid during digestion, for this dilutes the natural juices to such an extent that they lose their solvent power. Different persons have different requirements in this respect, according to the power of secreting saliva and gastric fluids freely or scantily and in a concentrated or diluted state. But, on an average, about half to three quarters of an imperial pint of water is a proper quantity to drink while eating an ordinary dinner, and this is better sipped during the meal than drunk at a draught either before or after it.

VEAL AND LAMB. Both are the flesh of young animals, which is less nutritive and less invigorating than that of full grown animals, as it contains more gelatine and less fibrine, and, as a rule, it is less easily digested. But lamb is more wholesome to most stomachs than veal. Roast veal especially is far more unwholesome than roast lamb, and often acts almost like a poison to delicate stomachs. This appears to be due in chief part to the quantity of the fat which, when over-heated on the outside of the meat, developes those acrid compounds, acolein and fatty acids, referred to under the head of "Beef and Mutton," and

these more deeply saturate and impregnate the young meat than the firmer flesh of older animals. Thus it is more difficult to avoid them by the expedient of cutting off the outside of the meat. It is very rare for boiled veal to disagree to the same extent as roast, and this is partly because boiling does not generate these poisonous compounds, and partly because it is more suited to the treatment of the abundant gelatinous constituents of young meat. As a rule, roast veal should be avoided by those with delicate stomachs.

PORK, is the flesh of young pig, and what I have said of veal applies in the main to pork, so far as nutritive value is concerned, but as there is more fat in pork than in veal, all the dangers of producing poisonous compounds, by roasting, baking and frying, are proportionately increased. The deepest parts of the lean of roast pork (if cooked through, so as to make sure of killing any parasites that may infest it, and to which pork is especially liable) may be eaten with impunity by most persons; but unfortunately this is not the cut generally liked, the browned outside being the favourite part, and the most dangerous. The younger the pork the less nutritive it is, but there is less chance of parasites, and in sucking pig this is reduced to a minimum. Now the objections to pork apply in a very much less degree to well-boiled pork. But boiled pork means salted pork, which raises a new difficulty. (See *Cooking, &c.*)

HAM AND BACON. These are the flesh of older animals than pork, and consequently, if digested, they are more nutritious; but as they are hardened by deep "curing," they are more difficult of digestion in their lean parts, and what I have said under the head of "Beef and Mutton" on the importance of "cutting thin slices across the grain", applies in its fullest force to these, and to all meats har-

dened by curing and pickling. The great value of bacon is as a store of fat in a compact and agreeable form, (See Fat), and when toasted in slices, which secures thorough cooking, the fat seldom disagrees even with delicate stomachs. This is not the case with the toasted lean. Much of the objection to cured meat is removed in the case of tongues in consequence of their peculiar "grain," which enables the digestive juices to penetrate them easily; and many hams and gammons of bacon, which have been well cured, well soaked, and skilfully cooked, and then thinly sliced across the grain, can be well digested by even weak stomachs; but all these provisions are necessary.

POULTRY, GAME, WILD-FOWL AND OTHER BIRDS. Except when the flesh is poisoned by what they have eaten, the flesh of all birds is safe for food. Great differences, however, exist as to digestibility and wholesomeness, and these depend mainly upon, three qualities. 1. The amount and quality of fat. 2. The length and size of fibre. 3. The density or closeness of the fibre. Abundant fresh air and exercise diminish fat and improve its quality, and render the fibre shorter and closer; whereas want of air and exercise increase the quantity and deteriorate the quality of the fat, and produce a loose long-fibred flesh. The fat of all birds is difficult of digestion by weak stomachs, and becomes more apt to disagree in proportion as it is more oily in quality, and when over-heated readily produces those irritating compounds (acrolein and fatty acids) already spoken of under the head of meats, and as the depth of the lean is not great, a large proportion of it becomes saturated with the over-heated surface-fat and participates in its unwholesomeness. This disadvantage of course increases with the smallness of the bird in proportion to its fat. The consequence of this combina-

tion of circumstances is that tamed and fattened birds or "poultry" are less nutritious, less easily digested, and more apt to disagree than wild unfattened birds or "game;" this is illustrated in the case of pheasants, which are rendered much less wholesome in the present day, when they are coddled and fed like tame poultry, than they used to be when they were left in a wild and natural condition, and in the case of barn-door fowls, which are more wholesome than those carefully fattened in yards and cages. In large poultry such as turkey, the deeper lean is almost out of reach of the poisonous influence of the outside over-heated skin and fat, and would be very wholesome, were it not for the bad effects of inordinate over-feeding with want of exercise, which impregnates all the tissues with oil. Water-birds even when wild become more deeply impregnated with fat than land birds, and are proportionately more apt to disagree.

VENISON AND HARE, rank with game, and the same observations apply to them as to game birds.

RABBIT, rather stands alone. The fibre is both long and dense. It is very quickly hardened by careless cooking. It requires softening and disintegrating, by gradual stewing commenced at a low temperature, and careful slicing across the grain to make it digestible. It is very apt to disagree from the difficulty of securing these conditions, without which it often absolutely resists thorough digestion by weak stomachs. If used for invalids it should be cut up and put in a jar with just enough *cold* water to cover it, then tied down and placed in a very slow oven till thoroughly cooked, when it may be turned out and eaten with its own gravy.

FISH. Fish differ considerably in their digestibility and nutritive value, in consequence of differences in the quantity of fat and the mode in which it is distributed;

and in the colour of their blood and the consequent tissue of their flesh. Salmon is a red-blooded fish, and its fat is distributed much as in red-blooded mammalia, and it approaches in nutritive value and digestibility more nearly to meat than to most fish. It is a very wholesome form of food, and when it disagrees it is usually, either, from its being eaten too freely forgetting how nearly it represents an equal weight of meat; or from neglect in cutting it up in thin slices across the grain, a neglect which is promoted by the readiness with which the flesh separates into dense flakes convenient for putting into the mouth, and by its being eaten either with a blunt silver knife or with a fork only; or from an inordinate quantity of fat being swallowed, in consequence of the large proportion of fat contained in those parts of the fish usually thought to have the most delicate flavour.

If these points are borne in mind, salmon in proper season, may be eaten with advantage by many delicate persons who otherwise would be obliged to refrain from it.

The following fish, like salmon, have their fat distributed through the tissues, as in the mammalia:—the herring, pilchard, sprat, mackerel, eel; but they differ much in the proportion of fat which they contain, and must be selected for different stomachs very much in proportion to the power of digesting and assimilating fat. Of these, eels are the richest in fat, containing from 14 to 24 per cent., while mackerel only contains about 7, and salmon and trout from 5 to 6 per cent.

Most other fish, as whiting, flounder, brill, turbot, haddock, cod, sole, plaice, are very deficient in fat; soles, for example, contain only 0·248 per cent., although it is often stored in large quantities in their livers as in the cod. But in addition to this difference in the proportion of fat contained in different fish, great varieties exist

in the closeness and toughness of their tissues. In cod, for example, the flesh is very dense and often tough and "woolly," when it is very difficult of digestion and should not be touched by those with weak stomachs. At all times cod, and other hard, dense-fibred fish, require careful cooking, and should be cut up in thin slices across the grain, not eaten in flakes with a fork only. The fat of fish is of an oily quality, (see Solid and Liquid Fats, Chap. V.) and cannot, even when abundant, take the place in nutrition of the solid fat of meat; and this and the great deficiency of fat in many fish, make a fish diet unwholesome unless properly admixed with other foods.

But, as an adjunct to other forms of animal food in a mixed diet, fish occupies an important place; and the lighter sorts of fish, such as whiting and sole, if judiciously cooked, are valuable in the sick room. For this purpose boiling is the safest mode of cooking, but frying may be permitted if the outside is rejected. If boiled fish is thought too insipid, an excellent plan is to finely mince the boiled fish with a little suet, bread crumbs, boiled potato, salt and pepper, make it into cakes, and brown them in the oven.

SHELL FISH. Lobsters and crayfish consist principally of dense tough muscular tissue, and are extremely difficult of digestion to most stomachs. The difficulty may, however, be greatly diminished by finely mincing the flesh across the grain before eating it. The hard parts of crab are open to the same objections as those of lobster, but there is more non-muscular material in the crab, which is easier of digestion, though apt to disagree with delicate stomachs from containing certain flavouring properties. Oysters differ greatly from lobsters, crayfish and crabs, being principally gelatinous (See Appendix) and fatty, and when the beard or gill and the hard muscle by

which the fish is attached to the shell are rejected, they form a digestible and fairly nutritious article of diet which generally agrees well with weak stomachs, especially when eaten raw, and they would be still more wholesome if minced or masticated instead of being swallowed in the usual way.

The hard roe of fish is very nutritious, and when properly cooked is usually digested with ease, and forms a very useful relish. The hard roe of a Yarmouth bloater laid open and nicely toasted, will often get down a slice of toast, or of brown bread and butter, when the appetite is bad; and even when preserved, in the form of caviare and potted cod's roe, may be used in small quantities to induce the stomachs of persons with educated tastes to take other food.

CHEESE AND CREAM CHEESE. "The time required for the digestion of cheese varies with its age and as the fat more or less abounds; and in a fairly good cheese of medium age it is from three and a half to four hours. New cheese and poor cheese require a longer time for digestion, inasmuch as they are masticated with greater difficulty. Old poor cheese also requires a longer time, for it is so hard as to be almost incapable of solution in the gastric juices, and if a good cheese be old and greatly decayed it plays the part of an irritant in the stomach which may cause a form of indigestion, and be itself hurried through the stomach into the intestines so rapidly as to almost prevent its digestion. It is probable that the establishment of cheese factories in America and in this country, will tend to produce cheese of more uniform quality. There are now nearly 2000 such factories in the United States, and three or four have been opened in England during the last five years. It is necessary for their success that there should be good pasture land and plenty of water in

the vicinity, and that the farmers should be able to take their milk to the factory while it is yet fresh and new. The manufacture of cheese by small farmers is not always effected in the most cleanly manner, neither, with the uncertainty of seasons, is it always lucrative. . . .

“CREAM CHEESE is more digestible than ordinary cheese, both because it is softer and may be readily masticated, and has a less proportion of casein. It is, moreover, probable that the process is effected in from two to three hours.” Dr. Edward Smith “*On Foods*,” pp. 125—127.

MILK. “There is no milk which is so agreeable and so little disagreeable to the taste as cows’ milk, for it has a fuller flavour than human milk, or that of the mare or ass, whilst it lacks the strong flavour of the milk of the buffalo or goat, and is not so surfeiting as that of the sheep. Some of these peculiarities in other kinds of milk depend upon the quantity of a nutritive material which may be readily determined ; but others, as the flavour of goats’ and buffaloes’ milk, depend upon an acid which is not so easily measured, and is not nutritious.

“The following is the chemical composition of several kinds of milk :—

	Sp. Grav. 1'000	Water.	Solids.	Casein and Nitrogenous Compounds.	Sugar.	Fat.	Salts.
Goat . . .	33'53	84'49	15'51	3'51	3'69	5'68	0'61
Sheep . . .	40'98	83'23	16'77	6'97	3'94	5'13	0'71
Mare . . .	33'74	90'43	9'57	3'33	3'27	2'43	0'52
Ass . . .	34'57	89'00	10'99	3'56	5'05	1'85	0'54
Woman . .	32'67	88'90	10'92	3'92	4'36	2'66	0'13
Cow . . .	33'38	86'40	13'59	5'52	3'80	3'61	0'66

“The salts in milk are as follows :—

	Per cent.		Per cent.
Phosphate of Lime .	. 0·30	Chloride of Potassium .	. 0·17
„ „ Magnesium .	. 0·06	„ „ Sodium .	. 0·03
„ „ Iron .	. 0·007	Free Soda . . .	. 0·04

“As milk is so essential a food for infants, and particularly when the mother’s milk cannot be obtained, it is desirable to prepare a kind which may resemble the latter in composition. Cows’ milk differs from human milk chiefly in having a larger proportion of fat and casein, and a less proportion of sugar. If, therefore, a mixture be made of two-thirds of cows’ milk and one-third of warm water, to which half an ounce of sugar of milk be added to the pint, we shall obtain a composition very similar to that of the mothers’ milk. If sugar of milk be not obtainable, it may be substituted by somewhat more than half the quantity of refined cane sugar. Asses’ milk differs from human milk chiefly in having more sugar and less fat, so that whilst it is not equal to human milk as a nutrient, it is the best natural substitute for it; but its use is recommended rather in cases of disease than of health, when it is desirable to modify the composition of the mother’s milk. Equal parts of asses’ milk and cows’ milk approach closely in composition to human milk.”—Dr. Edward Smith “*On Foods*,” pp. 315, 316.

VEGETABLES AND FRUITS.* It has been stated that every complete diet must contain some potash-vegetable or fruit, and the following is a list of such articles of diet. They differ, however, greatly in wholesomeness and nutritive value, as will be seen by the analysis table (Chapter II).

* For those vegetables and fruits which may be allowed in diabetes. See Diet Table for Diabetes, Chapter IV.

Vegetables.	Fruits.
Asparagus	Apples
Broad beans	Almonds
Brocoli	Chestnuts
Carrot	Cherries
Cabbage	Currants
Celery	Dates
Cauliflower	Figs
Cress	Grapes
Cucumber	Gooseberries
Endive	Lemons
French beans	Nuts and Filberts
Lettuce	Oranges
Mustard (green)	Pears
Mushrooms	Pine Apples
Onions	Plums
Parsnip	Prunes
Peas (green)	Raisins
Potato	Raspberries
Radish	Strawberries
Rhubarb	Walnuts
Spinach	
Turnip	
„ Tops	
Watercress	

The points to be especially borne in mind to promote the digestibility of fruits, are 1 to reject the skins, pips, and stones, and the cellular and woody materials such as form the “core” of apples and pears, and the segments of oranges and lemons. 2. In all the nut tribe to reduce them to a pulp or to meal before they are swallowed. Thus, chestnuts baked quite to meal are readily digested, and nuts beaten to a pulp in a mortar form a highly nutritious and digestible food. Whereas both are exceedingly indigestible in their natural condition.

With vegetables, great difference exists between such as may be classed as “green vegetables,” containing large quantities of elastic, fibrous, and woody tissue, which are quite indigestible; and the various sorts containing

much starchy matter, requiring thorough cooking to burst the starch cells and make it digestible (see Chapter VIII.); these are especially liable to be swallowed in lumps, the outside of which may be soft, but the centre hard and quite impenetrable by the digestive fluids. To prevent this they should be crushed with a fork, a precaution which will enable many delicate persons to digest potatoes, carrots, and the like, who could not otherwise touch them with safety.

In addition, however, to the question of actual digestibility, both vegetables and fruits may disagree from the essential oils which they contain, and upon which they depend in a great measure for their distinctive flavours. This kind of disagreement is of the least serious kind, consisting rather in unpleasant eructations than in the more distressing and dangerous symptoms due to masses of undissolved food. Stomachs have idiosyncrasies in this respect which must rather be individualised than classified. It may be stated, however, that when one species of the brassicacæ or cabbage tribe is found to disagree, the whole tribe will be also apt to do so, and this more and more in proportion as the essential oil is more abundant. For this reason they agree better when young than old, although this is also due to the smaller proportion of woody fibre and other indigestible tissue which they then contain.

After all, cooking, carving, cutting up, mastication, and careful rejection of indigestible parts while eating, will enable persons with weak digestions to vastly enlarge their usual list of permissible articles of diet, both animal and vegetable; and it is to these precautions that I would especially direct their attention, for it is of the highest importance to avoid unnecessarily limiting the variety of food allowed to all persons, but especially to those of

poor appetites and troublesome digestions. Monotonous, uninteresting meals, depress the spirits and are subversive of appetite, digestion and nutrition. (See Chapter IV.)

Finally, nobody should take meals in solitude. Society, merry talking and laughter, are wonderful aids to appetite and digestion, and promote all the functions necessary to healthy nutrition.

MODES OF COOKING IN COMMON USE.

Boiling, Roasting, Broiling, Baking, Frying, Stewing.

Boiling. There is an art in cooking food in such a manner as to avoid, as much as possible, the loss of its nutritive principles.

“If the object is to extract the goodness of the meat into the surrounding liquid, as in making soups, broths, &c., the article should be minced or cut up finely, and placed in cold water. After soaking for a short time, heat should be applied, and the temperature gradually raised. For broths, no actual boiling is needed—it is desirable, indeed, that it should be avoided, so as not to consolidate and lose the albumen. For soups, however, prolonged boiling is necessary, in order fully to extract the gelatine.”

If the object is to retain the nutritive properties in the meat, an opposite plan must be adopted. “The piece of meat should be large, and it should be plunged suddenly into boiling water and the process of boiling briskly maintained for about five minutes. This coagulates the albuminous matter upon the surface, and leads to the formation of a more or less impermeable external layer, which precludes the escape of the juices from the substance of the

meat. After this object has been fulfilled, instead of boiling being continued, a temperature of between 160° and 170° Fah. constitutes what is wanted, and this degree should be maintained, until the process of cooking is completed. Cooked in this way, the central part of the meat remains juicy and tender, and possesses, in the highest degree, the properties of nutritiveness and digestibility. Unless exposed throughout to the temperature named, the albuminous and colouring matters are not properly coagulated, and the meat presents a raw or under-dressed appearance. If exposed to a temperature much above 170° , the muscular substance shrinks and becomes proportionately hard and indigestible. The usual fault committed in cooking meat, is keeping the water in which it is being boiled at too high a temperature after the first exposure to brisk ebullition is over."

"Fish is rendered firm in proportion to the hardness of the water in which it is boiled. Hence, fish boiled in seawater or in water to which salt has been added is firmer, and, at the same time, more highly flavoured, than when boiled in soft water, on account of the less solvent action exerted.

"Upon the principle of endeavouring to retain, as far as practicable, the soluble constituents of an article of food, potatoes should be boiled in their skins, and the object aimed at is still further secured by the addition of a little salt to the water. By steaming instead of boiling the result is still more completely attained.

"Boiled food is more insipid than food cooked in other ways. From the lower temperature employed, no empyreumatic products are developed. Being more devoid of flavour, it is less tempting to the palate, but sits more easily on a delicate stomach.

"*Roasting*, should be conducted upon the same principle

as boiling. In order, as far as possible, to retain the nutritive juices, meat should first be subjected to a sharp heat. This leads to the formation of a coagulated layer upon the surface, which subsequently offers an impediment to the escape of the fluid matter within. After a short exposure to a sharp heat, the meat should be removed to a greater distance from the fire, so as to allow a lower heat gradually to penetrate to the centre. In this way the albumen and colouring matters are coagulated without the fibrine being corrugated and hardened. . . .

“On account of the greater heat employed, roasted meat is more savoury than boiled. The surface also is more or less scorched, and a portion of the fat is melted and drops away under the form of dripping. Some of the fat likewise, under a prolonged exposure to a strong heat, undergoes decomposition, attended with a production of fatty acids, and an acrid volatile product known as acrolein, which may cause derangement of a weak stomach. In boiling, the temperature is not sufficient to incur the risk of rendering the fat in a similar way obnoxious.” (See “On Wholesomeness and Digestibility of various articles of food”).

“When properly roasted, the meat is juicy enough within to lead to the escape of a quantity of red gravy when the first cut is made into it.

“*Broiling*, produces the same effect as roasting, but the proportion of scorched material is greater, on account of the relatively larger amount of surface exposed. The principle of cooking should be the same, in order to retain the central portion juicy.

“*Baking*, renders meat more impregnated with empyreumatic products, and therefore richer or stronger for the stomach than any other process of cooking. The operation being carried on in a confined space, the volatile fatty

acids generated are prevented from escaping, and thus permeate the cooked articles. Meat cooked in this way is ill adapted for consumption where a delicate state of system exists.

“*Frying*, is also an objectionable process of cooking for persons of weak digestive power. The heat is applied through the medium of boiling fat or oil. The article of food thus becomes more or less penetrated with fatty matter, which renders it to a greater extent than would otherwise be the case resistant to the solvent action of the watery digestive liquid secreted by the stomach. It is apt also to be impregnated with fatty-acid-products arising from the decomposition of the fat used in the process. These are badly tolerated by the stomach, and, whether generated in this way or when the food is in the act of undergoing digestion, appear to form the source of the gastric trouble known as heartburn.

“*Stewing* places food in a highly favourable state for digestion. The articles to be cooked are just covered with water, and should be exposed to a heat sufficient only to allow of gentle simmering. A considerable portion of the nutritive matter passes into the surrounding liquid, which is consumed as well as the solid material. Properly cooked in this way, meat should be rendered sufficiently tender to break down under moderate pressure. If boiling be allowed to occur, the meat becomes, instead, tough and hard.”

“*Hashing* is the same process, applied to previously cooked instead of fresh meat.

“By surrounding the vessel with water in which the article of food is contained, so as to secure that no burning shall occur, meat may be stewed in its own vapour. For example, a chop or other piece of meat taken upon a small scale, may be placed in an ordinary preserve jar, and this

tied over at the top, and partially immersed in water contained in a saucepan. The water in the saucepan is made to simmer, or gently boil; and when the proper time has elapsed, the meat is found perfectly soft and tender, and surrounded by a liquor derived from the juice which has escaped during the process. Meat thus prepared is in an exceedingly suitable state for the convalescent and invalid.

“Soups and Broths.” The process of preparation is here directed to extracting the goodness from the article employed, the reverse of that in the case of boiling. To accomplish what is aimed at in the most complete manner the articles should be chopped or broken into fine pieces, and placed in cold water. After being allowed to macerate a short time, for the soluble constituents to become dissolved out, it is gradually heated to a point which should vary according to the product required. In the case of broths and beef-tea, which properly contain only the flavouring principle of meat—*osmazome*—and the soluble constituents with finely coagulated albuminous matter, all that is required is to produce gentle simmering, and this should be kept up for about half-an-hour. In the case of soups, a prolonged gentle boiling is required in order that the gelatine may be extracted, this being the principle which gives to soup its property of solidifying on cooling.* Bones require boiling a longer time than meat. The chief principle they yield is gelatine, and its extraction is greatly facilitated by the bones being broken into fine fragments previous to being used.

“Salting, Pickling, and Smoking,” may be alluded to here for the sake of stating that by their hardening action, they give an article difficult digestibility, which cannot

* See Appendix VI. “New experiments on Gelatine.”

be overcome by cooking." "*On Food*," &c. By F. W. Pavy, M.D. 1874.

Dr. Letheby ("*on Food*"), gives the following table of the loss of weight, per cent., by cooking.

	Boiling.	Baking.	Roasting.
Beef generally . .	20 per cent.	29 per cent.	31 per cent.
Mutton generally .	20 "	31 "	35 "
Legs of mutton . .	20 "	32 "	33 "
Shoulder of mutton .	24 "	32 "	34 "
Loins of mutton . .	30 "	33 "	36 "
Necks of mutton . .	25 "	32 "	34 "
Averages of all . .	23 per cent.	31 per cent.	34 per cent.

CHAPTER IV.

SOME PRINCIPLES OF DIET IN DISEASE.*

PRINCIPLES UPON WHICH TO ARRANGE THE DIET OF DISEASE
—RULES FOR CARRYING OUT THESE PRINCIPLES—EXAMPLES
OF DIETS FOR CONSUMPTION, AND FOR DIABETES.

THIS subject is one upon which it would be very easy to write a large book, but which is very difficult to treat in a short chapter. I must content myself, therefore, with condensing what I have to say into a few statements of opinion, avoiding all attempts at discussion, and if I appear to deliver my views dogmatically it is not because I feel at all inclined to dogmatise, but because I am pressed by the extent of the subject and the narrow limits of our space.

At page 61, I have given “the Essentials of a Normal Diet” for health. The question now is, how ought these to be modified in disease? It will be observed that these “Essentials of a Normal Diet” provide for the maintenance of healthy nutrition in a “healthy adult man of average stature taking moderate exercise,” and, for simplicity’s sake, it will be the best to make all our remarks apply to this “adult man of average stature” *under altered circumstances*.

The first and leading principle of diet in disease is, to provide for the maintenance of healthy nutrition, under the peculiar alterations of circumstances attendant upon disease. In other words, the diet of disease should be as nearly that of health as the altered conditions of the nutri-

* Substance of a lecture delivered by the Author at the Royal Hospital for Diseases of the Chest, 1865.

tive functions, and the altered conditions of the patient's life will allow ; the grand object being to keep up healthy nutrition of the whole organism.

The true appreciation of this first principle, in its various bearings, will save us from running into* either of those extremes which at different times have disfigured medical practice. We shall not be led to starve our patients upon water-gruel, when they are craving for natural food ; or to stuff them with beef-steaks and porter when every instinct of their nature rebels against it. In fact, it may be taken as a very safe rule, that it is better cautiously to supply a patient with the kind and quantity of food that his stomach calls for, than to deny it to him without an unquestionably good reason for so doing.

This may seem very much like letting a patient eat and drink what he pleases. But that is not at all what I intend to recommend. All I mean is this, and I wish particularly to impress it, that if we intend to interfere in the subject of diet, we must take care that we thoroughly understand what we are about ; (see p. 5) and in order to do this it is necessary to keep well up in the following subjects :—

1. The physiology of healthy nutrition.
2. The composition of food, and the essentials of a normal diet.
3. The physiology of disease.

If we keep these matters well before the mind, and at the same time keep our wits about us in watching the case under treatment, it is surprising what an immense deal of good may be done by interfering with the diet ; but not otherwise.

We start, then with this as our first principle—never to be lost sight of—that healthy nutrition is to be maintained, if possible, under all circumstances. And we as.

sume that to do this in a "healthy adult man of average stature taking moderate exercise," the essentials of a normal diet must be supplied.

It must be borne in mind, that the proportions and quantities of the different elements of this normal diet are arranged to meet the requirements of the different functions of the organism when in a healthy state of activity; and it therefore follows, that if the activity of any of these functions is altered, the requirements will be altered; and hence, the second general principle is this:—To alter the quantities and proportions of the elements of a normal diet to correspond with any alterations in the conditions of life. Thus, when a man is overtaken by sickness, and confined to his room or bed, the adult man taking moderate exercise becomes *an adult man taking no exercise*; and the ingredients of his diet which were proportioned to his moderate exercise must now be proportioned to his no exercise; and other alterations must be made in like manner, to correspond with other altered circumstances, in addition to any that may be specially required by the nature of his disease.*

But I must remind you that, even when a man is confined to his bed, and precluded from taking any kind of exercise, he is still necessarily undergoing a considerable amount of muscular exertion, which must be provided for in his diet. For example, so long as life remains, such all-important muscles as those of respiration, and the heart itself, continue to act, and to require that their healthy nutrition shall be provided for by a supply of plastic materials in the food.

* See "Food, Heat, and Motion," p. 51. It is there shown that the mechanical work of the heart, respiration, and other vital functions, require sufficient food daily, to generate 400 foot tons of mechanical force. But the food necessary to generate the 290 foot tons usually required for external work, may be omitted from the diet of one taking no exercise.

We come next to the long list of alterations of function which may be involved in the term "Sickness." And the third principle is—To alter the forms, quantities, and proportions of the elements of a normal diet, to meet the altered relations in the activity and condition of organs consequent upon disease. It is evident that, in order to carry out our first principle of maintaining healthy nutrition under all circumstances, it may be necessary, under some conditions, to reduce the quantity of every element of diet; and also, under some circumstances, to alter the proportions of the different elements. This we see demonstrated in some of the lower animals by the phenomena of hybernation. When an animal gives itself up to its winter sleep, every vital function is reduced to its lowest degree of activity; and the animal is able to maintain healthy nutrition for a long period without taking any food at all; but as respiration has to be kept up more actively than the rest of the functions, a special store of carbon for this purpose is laid up beforehand in the body.

Now, supposing a man to suffer from any state of disease which should place him in the position, as regards his functions, of an animal during hybernation, it is clear that, while his whole diet must be reduced to a very low scale, the heat-giving elements must be supplied in quantities out of the normal proportions as compared with the rest; because no supply of carbon is stored up in preparation for his illness, as it is in the hybernating animal in preparation for its sleep.

We see conditions, in many respects similar to these in some stages of fevers, in which absorption, nutrition, and every vital function is at its lowest point consistent with life, respiration being the only one sufficiently active to call for any considerable supply of food. But here, of

course, we must not lose sight of an element in the case not present in hybernation—viz., the existence of a poison, which by some means, natural or artificial, has to be eliminated or destroyed, and which may be keeping some functions in activity, the requirements of which must be met. The precision with which we are able to do this in any given case, will depend upon the correctness of our knowledge of the nature of the poison, and of the organs concerned in the restorative process. Here, no doubt, we are often obliged to act in the dark, and to supply many ingredients which may not be needed, in the hope of furnishing among them that which is required, but which our ignorance prevents us from identifying. And we had far better, whenever our knowledge is at fault, act in this safe manner and supply much that may be useless rather than run the risk of withholding that which may be essential to life. But, in the majority of cases, our knowledge will be sufficient for the emergency, if we keep in mind the general principles of action.

The fourth principle is this:—To obtain rest for every organ while it is suffering under active disease, by removing from the diet such elements as increase its functions. These are conditions which it is not always easy to fulfil without deviating from our first principle. For example—in the case of diseased kidney—the healthy nutrition of this organ requires a supply of albuminoid materials, while its function is increased by any surplus of these materials in the organism; and when its function is interrupted by disease, a proportion of albuminoids in the diet, necessary to the healthy nutrition of the organism generally, will be tantamount to an excess as regards the function of the kidney, and the accumulation of retained excretory matters will press injuriously upon the affected organ. In such a case other medical aids than diet must

be brought to bear; and while the albuminoids in the food are reduced as low as is consistent with healthy nutrition, some auxiliary organs which are not damaged must be stimulated for the time, to save the diseased part from undue pressure upon its functions.

A simpler, but still important principle, may be stated as the fifth, viz.:—In all alterations of diet, to avoid any unnecessary reduction in the number and variety of the forms in which food is allowed to be taken. (See p. 83, “Wholesomeness and Digestibility of various articles of food).” This becomes especially necessary to be borne in mind when dieting the dyspeptic, who are often still engaged in the active avocations of business and of society while under medical treatment. To treat such cases by cutting off from the daily bill of fare first one article and then another, till the food consists of only two or three permitted forms, is to destroy the appetite and the digestive powers by monotony of diet, and to depress the spirits of the patient by a constant series of petty denials. This plan of dieting can only be regarded as the resource of ignorance; because an enlightened view of the case will discover some particular defect in the function of digestion or assimilation which will at once indicate the form or element of the food which is to be avoided; and thus it will be only necessary to cut off those articles which specially represent this element, or simply to alter the forms in which they are presented to the stomach. (See p. 4).

The sixth principle is also of great importance, viz.:—When it is necessary to remove from the food any of the essentials of a normal diet, to aim at selecting that which will answer the desired end with least danger to the nutrition of the vital organs. For example, if it is necessary for any special purpose to diminish the heat-giving elements of the diet, it is safer to remove the carbonydrates

than the hydro-carbons, because the latter not only supply carbon for the evolution of force, but are essential to the nutrition of the nervous system, and of the albuminoid tissues generally. (See Fat, Chapter V.)

The seventh and last principle which I shall give in this Lecture is of very general application :—When it is desired to *increase* the normal nutrition of a tissue or organ, we must not only supply it freely with the special materials requisite for its development, growth, and repair, but at the same time call upon it for the performance of its normal functions—over-fed idleness insures morbid nutrition, not healthy life.

In the next place I will give you a few *Rules* which may assist you in carrying out these general principles.

Rule 1.—When the power of appropriating any essential ingredient of a normal diet is lost to the organism, the lost function must be substituted by some artificial process, or the ingredient in question must be withdrawn from the diet till the normal function is restored. In obedience to this rule we administer pancreatic emulsions of fat* to patients, who have lost the power of assimilating fat without this artificial assistance, while we adopt all practicable means of restoring the normal function.†

Rule 2.—Is inseparable from the first, and it is this :—No essential of a normal diet must be withdrawn, without an attempt being made either to supply to the organism in some other way the ingredient of which it is deprived, or to suspend those functions which call for a supply of this ingredient. Thus, to take a simple illustration :—Suppose the power of digesting meat to be lost through a deficient secretion of gastric juice, meat must be withdrawn from the diet till the lost function is restored, or

* See Appendix for mode of preparing "Pancreatic emulsion."

† See Diets for Consumption.

else an artificial digestive fluid must be introduced ; or if it is impossible by these means to maintain the digestion of meat, the physiological ingredients of meat must be supplied in the form of some albuminoid solution ; or, finally, if this cannot be done, then those functions which principally waste the albuminoid tissues of the body must be placed as far as possible in a state of rest, muscular action must be suspended until the function is restored.

Rule 3.—If an undue waste of any elements of normal nutrition is found to be going on in the organism, and the means remain of appropriating those elements from the food, they must be supplied in the food in quantities as much in excess of those proper to the normal diet of health as will be sufficient to supply the waste, until it is stopped. This also may be illustrated by a very simple example. In Bright's disease of the kidney there is no loss of the power to appropriate the albuminoids from the food, whereas a constant loss of albumen is going on through the kidneys, which must be met by proportionate increase of the albuminoids in the diet. But in following this rule, in this particular case, it will be necessary to observe the precautions which I mentioned when speaking of the fourth general principle.

Rule 4.—When through any defect in the organism, the elements of a normal diet are lost to nutrition if presented in the usual forms, those forms must be changed ; but care must be taken that in the altered form all the essential elements of a normal diet are supplied in their proper quantities and proportions. Nothing can illustrate this better than the use of milk as a substitute for solid or mixed foods in diarrhoea or sickness.

Rule 5.—Has to deal with more complicated difficulties. If such a defect exists in the organism that *some* of the

essentials of a normal diet are misappropriated, so that the organism is deprived of one or more of the normal elements of nutrition, and at the same time a disease is constituted out of the misappropriated food, then we have a double duty in interfering with the diet. First, the source of the disease must be stopped by withdrawing that part of the diet out of which it is constituted; and, secondly, the elements of nutrition thus removed must be supplied by some other means or in some other form.

Thus, in diabetes, the saccharine and amylaceous elements of the diet are misappropriated; they do not serve their normal function of supplying carbon for the evolution of heat, and by passing off through the kidneys they constitute an exhausting disease. It is necessary, therefore, to stop the source of this disease by cutting off the saccharine and amylaceous ingredients of the diet till normal nutrition is restored. But, in the meantime, as carbon must be obtained by some means, it is taken from the fat stored up in the body, so long as that lasts, and when it is gone from the albuminoid tissues themselves, till the whole organism is disintegrated; unless at the same time that we cut off the starch and sugar, we increase the quantity of *fat* supplied in the food as much in excess of the proportion proper to a normal diet as shall fully supply the demand.*

The modern dietetic treatment of diabetes may be taken as a good example of the way in which increased knowledge of the nature of disease and of the physiology of food enables us to act under what I have called the fifth principle of diet, viz., to avoid any unnecessary reduction in the number and variety of the forms in which food can be taken. In former days the poor parched diabetic was

* See Diet for Diabetes, p. 104.

forbidden to drink water lest he should increase his flow of urine ; now we are able to let him quench his thirst as much as he pleases, so that he takes nothing which contains starch or sugar ; and again, by preparing his articles of food in such a manner as to exclude the injurious ingredients, and by selecting those which are known to contain them in the smallest quantities, or not to contain them at all, we are able to present the diabetic with a fairly tempting and varied diet, so that he is able to keep to it for months and years with comparatively little difficulty. See p. 4.)

DIETS FOR CONSUMPTION.

In these Diets for Consumption it is assumed that no fat is assimilated except that artificially pancreatised.

In Table I. The required amount of carbon is supplied by an excess of carbo-hydrates. (See p. 95).

In Table II. The required amount of carbon is supplied by an excess of albuminoids. (See p. 95).

In Table III. The amount of carbon is kept low, because it is only intended as a temporary diet to be used during periods of rest in a warm room. The arrowroot and some of the fat of the milk are pancreatised by mixture with the "pancreatic emulsion."* (See p. 91).

* See Appendix for mode of preparing "Pancreatic Emulsion."

DIETS FOR CONSUMPTION.—TABLE I.—CARBO-HYDRATE.

Food for 24 hours.	Oz.	Plastic.	Fat.	Saccharine.	Total Carbon.	Carbon from	
						Nitrogenous.	Non-Nitrogenous.
Cooked Meat	6	1'350	'534	..	1'152	0'732	0'420
Bread	10	1'000	'070	4'530	2'470	0'540	1'930
Potatoes	8	0'136	..	1'840	0'832	0'072	0'760
Sugar	2	..	..	1'800	0'848	..	0'848
Milk 20 fluid ozs.	2½	1'000	0'700	0'840	1'440	0'540	0'900
Liebig's Foods for Infants	2	0'300	0'116	1'064	0'720	0'162	0'558
Farinaceous Foods	6	0'300	0'020	4'900	2'350	0'160	2'190
Fermented Liquors* . . . . .	..	..	..	..	1'000	..	1'000
Pancreatic Emulsion†	2	..	1'000	..	0'740	..	0'740
TOTALS	37½	4'086	2'440	14'974	11'552	2'206	9'340
Deduct Carbon from Non-pan- creatised Fats as waste. . . . .	..	..	..	..	0'945	..	..
Total available Carbon . . . . .	..	..	..	..	10'607	..	..

* Either—Half a pint (Imperial) of Port, Sherry, or Marsala; or, One Pint of Burgundy Claret, or other similar Wine; or, One Pint of good Ale or Stout; or, a quarter of a pint of Rum, Whisky or Brandy, diluted with one pint of water.

† See Appendix

DIETS FOR CONSUMPTION.—TABLE II.—ALBUMINOID.

With this Diet Hydrochloric Acid and Pepsine should be given to assist in digesting the very large quantity of Plastic Matter.

Food for 24 hours.	Oz.	Plastic.	Fat.	Saccharine.	Total Carbon.	Carbon from	
						Nitrogenous.	Non-Nitrogenous.
Cooked Meat	8	1'800	0'712	..	1'536	0'976	0'560
Pigeon or Game	6	1'300	0'830	..	0'830	0'740	0'090
Dried Fish	3	1'310	0'055	..	0'745	0'710	0'035
Cheese	1	0'308	0'256	0'024	0'366	0'166	0'200
Vermicelli	3	1'425	..	1'164	1'293	0'777	0'516
Bread	4	0'400	0'030	1'810	0'990	0'220	0'770
Rice or Arrowroot	6	0'300	0'020	4'900	2'350	0'160	2'190
Sugar	3	..	..	2'700	1'270	..	1'270
Milk 20 fluid oz.	2½	1'000	0'700	0'848	1'440	0'540	0'900
Green Vegetables	6	0'060	0'012	0'468	0'234	0'030	0'204
Fermented Liquors*. . . . .	..	..	..	..	1'000	..	1'000
Pancreatic Emulsion†	2	..	1'000	..	0'740	..	0'740
Totals	43½	7'903	3'615	11'906	12'794	4'319	8'475
Deduct Carbon from Non-pan- creatised Fats as waste . . . . .	..	..	..	..	1'410	..	..
Total available Carbon . . . . .	..	..	..	..	11'384	..	..

* Either—Half a pint (Imperial) of Port, Sherry, or Marsala; or, One Pint of Burgundy, Claret, or other similar Wine; or, One Pint of good Ale or Stout; or, a quarter of a Pint of Rum, Whisky or Brandy, diluted with one pint of water.

† See Appendix.

DIETS FOR CONSUMPTION.—TABLE III.—FLUID DIET.

	Oz.	Plastic.	Fat.	Saccharine.	Total Carbon.	Carbon from Nitrogenous.	Carbon from Non-Nitrogenous.
Milk 78 fluid oz.	10	3'900	3'730	3'276	5'620	2'106	3'510
Arrowroot	6	0'300	0'020	4'900	2'350	0'160	2'190
Pancreatic Emulsion*	2	..	1'000	..	0'740	..	0'740
TOTALS	18	4'200	4'750	8'176	8'710	2'266	6'440

This diet is to be given as follows :—

8 ozs. of Milk and 1 oz. of Arrowroot every 4 hours (6 times in 24 hours) for 24 hours.

10 ozs. of Milk and 1 oz. of Arrowroot every 4 hours for 24 hours.

12 ozs. of Milk and 1 oz. of Arrowroot every 4 hours for 24 hours.

13 ozs. of Milk and 1 oz. of Arrowroot every 4 hours for 24 hours.

The last quantity to be continued until solid diet can be borne by the stomach.

One-third of an oz. of Pancreatic Emulsion is to be mixed with a little water, or with a portion of the milk, and given directly after each dose of Arrowroot and Milk, not mixed with the whole bulk.

* See Appendix.

DIET FOR DIABETES.

Table IV. In this Diet starch and sugar are reduced to a minimum and fat and albuminoids are given in their place, some of the fat being introduced in the form of Pancreatic Emulsion to assist in its assimilation. (See p. 97).

TABLE IV.—DIET FOR DIABETES.

With this diet Hydrochloric Acid and Pepsine should be given to assist in digesting the very large quantity of Plastic Matter.

Food for 24 hours.	Dry oz.	Plastic.	Fat.	Saccharine.	Total Carbon.	Carbon from		Carbon from Saccharine portion of Non-nitrogenous.
						Nitrogenous.	Non-nitrogenous.	
Cooked Meat and Poultry	8	1'800	0'712	..	1'536	0'976	0'560	..
Cooked Pigeon or Game	6	1'380	0'110	..	0'830	0'740	0'090	..
Dried Fish (Haddock)	3	1'310	0'055	..	0'745	0'710	0'035	..
Cheese	1	0'308	0'250	0'024	0'366	0'166	0'200	..
Van Abbott's Gluten Bread or								
Gluten Vermicelli	6	3'556	0'030	1'148	2'438	1'928	0'510	0'510 } 0'612
Green Vegetables*	3	0'030	0'006	0'234	0'117	0'015	0'120	0'102 }
Fermented Liquors† (Brandy or Whisky) 5 fluid ozs.	..	..	..	..	1'000	..	1'000	..
Butter (pure)	2	..	2'000	..	1'480	..	1'480	..
Pancreatic Emulsion†	1½	..	0'750	..	0'555	..	0'750	..
Eggs (2)	3	0'440	0'320	..	0'260	..	0'260	..
Bacon	3	0'250	1'880	..	1'620	0'135	1'485	..
TOTALS	36	9'074	6'113	1'406	10'947	4'670	6'472	..
Carbon from Saccharine to be deducted as waste	..	..	..	..	0'612	..	..	..
Total Carbon available	..	..	..	..	10'335	..	..	..

Salt to taste. Water as much as required by thirst. Tea without Sugar, with a slice of lemon peel in it.

* Green vegetables permitted.—Cress, Celery, Endive, Greens, Lettuce, Mustard, Spinach, Water-cress.

† The following Wines may take the place of Spirits, (for equivalent quantities see Alcohol Table), Claret, Moselle (still) Rhine Wine, Manzanilla, Greek (St. Elie), very dry Amontillado Sherry.

‡ See Appendix.

CHAPTER V.

FAT.

FAT ESSENTIAL TO HEALTHY NUTRITION—IMPORTANCE OF DISTINGUISHING BETWEEN SOLID AND LIQUID FAT—ON GETTING THIN—BANTINGISM—ANALYSIS OF BANTING-DIET, SHOWING ITS ERRORS AND ADVANTAGES—ON GETTING FAT—FAT AND STARCH IN THE NUTRITION OF CHILDREN.

FAT is so essential to the maintenance of healthy nutrition, that the quantity contained in the daily food cannot be reduced much below the proportions given in the “Essentials of a normal diet” and in the normal-diet tables, without great risk of damaging the health.

When it is necessary for any special object to reduce the quantity of carbon taken in the aliments, this can more safely be done by diminishing the saccharine and amylaceous matters than the fats.

The importance of fat in nutrition should be studiously borne in mind by those who construct diets for the poor, for public institutions, or for the treatment of obesity, diabetes, fatty degeneration, dyspepsia, and the like.*

THE IMPORTANCE OF DISTINGUISHING BETWEEN SOLID AND LIQUID FATS.†

The peculiar isomeric modifications of which stearin and palmitin are susceptible, as shown by Duffy, pointedly

* See Chapter IV. “ON DIET IN DISEASE.”

† Substance of an Article by the Author in the “CHEMICAL NEWS, Sept. 4th, 1868.”

distinguish them from olein, which, so far as at present known, has not this susceptibility; a distinction which is supported by the different behaviour of oleic acid towards chlorine and bromine, from that of stearic or margaric acids (Lefort), and by the different action of bile upon stearic acid and upon oleic acid (Marcet).

But I think we ought to be prepared to learn, that solid and liquid fats differ in some important physiological properties, by the first general fact concerning the constitution of all natural fats—viz., that they are mixtures in varying proportions of at least four different bodies, of which the melting points so widely differ—stearin melting at 144° F., palmitin at 114.8° F., margarin (probably a compound of stearin and palmitin) at 116° F., while olein remains fluid at 32° F.

That the different degrees of solidity of fats depend upon the proportions in which the solid ingredients are mixed with olein, that olein has a peculiar power of dissolving the solid ingredients, and that the melting point of the mixture is thereby reduced, appear to me to be facts pointing in the same direction as the foregoing, especially when we remember that the affinity of oleic acid for oxygen is much greater than that of the other fatty acids.

The fatty bodies obtained from warm-blooded animals are generally solid at ordinary temperatures, whilst those from fish and from cold-blooded animals are liquid.* And when we consider the high melting points of the solid fats as compared with the temperature of the body in warm-blooded animals, it is evident that the fat in them would be solid at the temperature of their blood, but for the mixture of olein, by which the melting point is reduced.

* See Wholesomeness and Digestibility of various articles of Food, Chapter III.

Therefore the solidity or fluidity of the fat in living animals is determined by the proportion of olein, which is able to be mixed with the stearin, palmitin, and margarin in each individual; and we are forced to conclude either that it is of no importance whether the fats of the body during life are in a solid or liquid state, or that it is important in what proportion the olein, stearin, etc., shall be combined.

It has been already proved by experiments on the fattening of cattle, that the solidity or fluidity of the fat in the body varies with the food—that cattle fattened upon linseed cake, for example, accumulate, in their adipose tissue, an oily material of unusual fluidity (Draper), and that the consistence of butter is dependent upon the kind of food given to the animals from which it is produced (Fownes).

The fat in animals is particularly liable to accumulate immediately beneath the cutis, in the omentum, and around the kidneys; and the fat found in the latter situation, where it is subject to a more uniformly elevated temperature than in the integument, is well known to be of a more suety character—that is to say, it contains a smaller proportion of olein, and has a higher melting point. These familiar facts point again to some importance, in the animal economy, attaching to *the melting point of the fat and the consequent degree of fluidity* in which it should exist during life.

With regard to the fat of the integument—the principal deposit of adipose tissue in the body—it appears to me self-evident that the fluidity of this fat must vary with the temperature of the atmosphere in which the animal is placed; to what extent this is the case, is, in my opinion, a most important subject for enquiry; and although the

experiments to determine the question are yet deficient, I hope soon to be able to supply them.*

In conclusion, what I now suggest as a general proposition, is this:—That, in all probability, the stability of the fats of the animal body in resisting too rapid oxidation is dependent upon the degree of solidity which they possess at the temperature of the living animal at any given time; that alterations in external temperature may affect the solidity of the adipose tissue of the integument, and, consequently, its power of resisting oxidation; and that, therefore, in all probability, it is of great importance that the food of an animal shall contain a certain proportion of material capable of supplying the adipose tissue with *solid* fat: *i.e.* fat having a high melting point.

ON GETTING THIN.

On comparing the following analysis of Mr. Banting's diet for getting thin with my tables of normal diets it will be seen that it yields less than half the normal quantity of Carbon, leaving the deficiency to be obtained from the fat already stored up in the system, by the consumption of which the obesity is removed. The fault consists in this reduction of Carbon being obtained by diminishing the Hydro-carbons (fats) of the food instead of only cutting off the Carbo-hydrates (Sugar and Starch).

* This statement was first published in 1868, and, up to the present time 1875, the difficulties attendant upon the experiments have baffled those who have attempted to solve the question.

MR. BANTING'S DIET. (APPROXIMATE ANALYSIS).

Liquid. fluid ozs.	Dry. ozs. avoird.	Food for 24 hours.	Water. ozs.	Plastic. ozs.	Fat. ozs.	Saccha- rine. ozs.	Carbon. ozs.
	14	Meat, Poultry, Game and Fish	9'25	3'15	1'25	....	'98
	2	Bread	0'84	0'20	0'01	'90	'39
	2	Vegetables (green)	1'79	0'02	....	'15	'07
	3	Fruit	2'52	....	....	'40	'15
16		Tea	16'00	....	....	....	'02
14		Wine (Claret) .	13'00	....	....	....	'70
30	21		43'40	3'37	1'26	1'45	2'31
In Plastic matter . . .							1'82
Total . . .							4'13

It has happened to me to have to do with a great number of persons who have tried Bantingism, and I do not hesitate to say that, up to the present time,* Mr. Banting has done a great deal more good than harm. He did not bring forward a single new fact or new idea, but he had the luck, by zealously advertising a striking case of the effects of a plan of treatment long familiar to every medical man who understood physiology, to convince the public of the immense influence on the animal organism of modifications in the quality of food—an influence in the importance of which they did not half believe when urged upon them in the form of medical advice.

Mr. Banting candidly told his readers that he was ignorant of the physiology of food, but they did not care for this while determined to try his plan, and hence it is not to be wondered at that while many have been benefited many have done themselves harm. But the harm

* This was first written in 1864 and I can safely repeat it now : 1875.

that has been done at present is not very great and is nothing to compare with the harm that will come, if, frightened by some striking case in which Bantingism has nearly cost a man his life, the public rush away from it as blindly as they rushed into it, and establish for a time such a popular prejudice against systems of diet, that a medical man shall not be able to institute those rational and scientific regulations of diet which are often more important than any other means of treatment in the management of disease.....The plain and simple facts of the case are these. 1. A certain amount of fat in the system in one of the most essential elements of health. 2. The quantity required by different individuals to maintain health differs. 3. The effects of a deficiency of the quantity actually required in any given organism are most disastrous, the tissues of the body and the brain and nerves being at length disintegrated to supply the elements of fat which they contain. 4. When there is a quantity of fat in the body in excess of that necessary to health, it may be lessened with great and needed advantage provided it be done slowly and cautiously—allowing the nutritive functions of the system to accommodate themselves gradually to the altered condition—and most peremptorily stopping the loss of fat before it has amounted to a deficiency in the quantity necessary to healthy nutrition. *Nothing is easier than to make a fat man thinner by altering his diet*, but to do this safely and well is by no means devoid of difficulty, and in a large number of cases requires the greatest caution, consideration and judgment on the part of those who rule the modifications in the diet of the patient. But there is no denying that, with such care and judgment, it can in most cases be done safely and advantageously. .

ON GETTING FAT.

The measures necessary for getting fat are of course the reverse of those for getting thin. They consist in—1. An abundant supply of carbo-hydrates and hydro-carbons (fats, starch and sugar) in the food. 2. Means to promote the assimilation of these. 3. Means to prevent waste by oxidation.

The artificial fattening of cattle is secured by the adoption of similar measures, and affords the most familiar and striking illustration of the subject.

In this case, (see Draper's *Physiology*, p. 251) the first indication is satisfied by the purposed employment of oleaginous and farinaceous articles, as for instance, linseed cake, or by the selection among ordinary food substances, of those which, like Indian corn, abound in oil. It is to be remarked that the increase of weight of an animal may take place in two ways: first, by adding fat to the deposit in the adipose tissues; or second, by development of the muscles. It might perhaps be permissible to speak of the former as *adipose* fattening, the latter as *albuminised* fattening. According as it has been subjected to one or other of these processes, an animal will be very differently prepared for undergoing severe exercise. A horse fed with Indian corn cannot maintain himself under severe exercise so well as if he had been fed on oats. In the former case his adipose tissues have been developed, in the latter his muscular.

The third indication is met by resorting to every expedient which can restrain the action of the respired oxygen. A state of perfect quiescence is therefore to be observed. Muscular movement of every kind increases the activity of respiration. On the contrary, rest diminishes it. If in addition to this state of quiet or rest, sleep

likewise be indulged in, the object is still more perfectly attained; and if a high temperature be also resorted to, since this checks the oxidation needful for maintaining the system at its due temperature, this further diminishes the waste of fat.

Under such circumstances, where everything is done to give a supply of fat, and everything to prevent its consumption, it may be caused to accumulate in the tissues to an extraordinary amount. But this very soon interferes with the action of the liver.

FAT AND STARCH IN THE NUTRITION OF CHILDREN.*

A very interesting article by Dr. Prospero Sonsino, of Pisa, in the September, (1872) number of the "Practitioner." "On the Physiological Dyspepsia for Starchy Food in Infancy," revives an intention, from which I have been diverted by other occupations, of publishing a few words on an allied subject.

I propose to speak of the class of cases constituting that wretched form of "atrophy and debility" and "marasmus" in children, in which every part of the body wastes away except the abdomen; the state described by Dr. Druitt, in the last edition of his "Vade Mecum," in the following few and graphic words:—"Emaciation and voracity; the belly swelled and hard; the skin dry and harsh; the eyes red; the tongue strawberry-coloured; the breath foul; the stools clay-coloured and offensive, sometimes costive, sometimes extremely relaxed; the patient usually dies hectic" (p. 75).

* Substance of an article by the Author in the "PRACTITIONER."

I wish to bring prominently forward the fact that this state, provided there is no advanced lung-disease, is *rapidly cured by Pancreatic Emulsion* given in doses of a teaspoonful every four hours, and regularly persisted in till fat and flesh are restored.* It is, of course, necessary that a proper diet should be insisted on at the same time; but proper diet without the Pancreatic Emulsion will not do. This I have found over and over again in cases where everything judicious in the way of feeding and cod liver oil had been carefully and perseveringly tried without avail, but which, on the addition of the Emulsion to the previous diet, began at once to improve.

This fact has been familiar to me for a long time; and considering how largely Pancreatic Emulsion is now used in the wasting diseases of adults, I am surprised to find that it is not even referred to in the latest works on the diseases of children. Looking through these works and examining their indexes, one is led to the conclusion that their authors are not aware that there is such an organ as the pancreas, or that pancreatic juice has ever been used in any form in the treatment of disease.† Yet scarcely a week now passes but some general practitioner relates to me cases of the successful use in his own practice of Pancreatic Emulsion in the wasting of delicate children.

Dr. Prospero Sonsino's paper will, I hope, excite more general attention to this important subject. He, however, has laid all the stress of his observations upon the influence of the salivary and pancreatic juices on the digestion of *starch*. This is unquestionably a point of

* (See Appendix IV.)

† The word "pancreas" does not occur in the indexes of the last editions of West, Tanner, Vogel, Meigs and Pepper, Eustace Smith, Churchill, on Diseases of Children.

the greatest importance in the case of very young children brought up by hand, as showing the absurdity of attempting to nourish them upon starchy food, not artificially digested, before the period of life at which the saliva and pancreatic juice attain their functional activity. And even then, as Dr. Sonsino afterwards remarks, "good reasons make us now believe that really it is not proper to feed infants with copious starchy matters, however these may be rendered digestible." The principal results of Dr. Sonsino's investigations are summed up in the two following conclusions, which, however, are not new:—1. "Pancreatic juice in dogs, cats, and rabbits, in the first week of life—perhaps for some days more—is devoid of any digestive action on starch." 2. "In the early life of man, probably till the beginning of dentition, infants offer a true physiological dyspepsia for starchy aliments, caused by the inactivity of one at least—possibly of all—the humours that concur in the digestion of those aliments" (saliva, gastric juice, pancreatic juice, enteric juice).

No doubt, when wasting occurs in these early periods of life, it is very often due to foolish attempts to nourish children upon farinaceous foods, by which dyspepsia and diarrhoea add to the exhaustion of partial assimilative-starvation. But, as a matter of fact, farinaceous food is seldom depended upon without some addition of cow's milk or some assistance from lactation; and we see children suffer from wasting who are fed entirely upon cow's milk or nursed by their mothers, and in such cases the "physiological dyspepsia for starchy food" will not account for their decline. Therefore we must not forget, that although normal saliva only acts upon starch, normal pancreatic juice acts also upon fats; and it is probable that these two functions of the pancreas are sufficiently

independent of each other that they may exist separately. This I pointed out in my paper to the Royal Society in 1868, "On the Special Action of the Pancreas on Fat and Starch" (See Appendix IV.) It [is there stated as the results of my experiments, that "in addition to the influence of the pancreas upon fat, it has the power of converting starch into glucose by simple mixture. This property remains to a certain extent *after the pancreas has exhausted its property of acting upon fat.* The quantity of pancreas which before mixture with fat will convert about eight parts of starch into glucose, after saturation with fat will still convert about two parts of starch into glucose." It is possible, therefore, that in different states of depraved health one or other of these properties of the pancreatic juice—that for the digestion of starch, or that for the digestion of *fat* may be deficient. And thus the depraved nutrition due to such deficiency will not be limited to the period of life anterior to that at which, under normal conditions, the proper functions of the pancreas should be developed. It is evident that when the power of digesting fat fails to be developed at its proper time, the defect must tell with double force upon children already suffering from deficient digestion of starch.

The children who become the subjects of the kind of wasting of which I am now treating are especially: (1) those who are suckled by mothers whose milk, though abundant in quantity, is extremely deficient in nutritive properties; (2) those who are brought up by hand; and (3) those who, at a later period of childhood, have been subjected to similar chronic defects in diet. Now, it is especially when the mother's milk is poor in fat and lactin that the child becomes "dissatisfied" and "craving," and in the majority of cases it is this which leads

to the introduction of farinaceous food, under the popular nursery belief that it is "*satisfying*;" and, as Dr. Sonsino states, if this is given before the power of digesting starch is established, of course nothing but mischief can result.

But organs, like individuals, do not rise to the full performance of their duties unless called upon by the necessity for their activity; and, as I pointed out in 1866 ("On Tuberculosis," p. 40, second edition), "As the mother is deprived of fat-elements by lactation, so is the child deprived of them by a persistence in a diet deficient in milk. In the case of the child thus deprived of fat, a double injury is done, first, by cutting off the supply of fat-elements necessary for the protection of the tissues; and secondly, *by paralysing the function of the pancreas by prolonged inactivity.*" I venture to think that this is a point deserving far more attention than it has yet received.* It accounts in a great measure for the impossibility of restoring these ill-nourished wasted children by any kind of *natural* diet after they have been allowed to remain in a chronic state of defective nutrition. A child that has been long fed upon diet deficient in fat fails to develop the fat-digesting properties of the pancreatic secretion, and thus, when proper food is at last presented, cannot make use of it for nutrition.

It is probable, therefore, that it is due to this conjunction of circumstances that these wretched cases of fatal infantile wasting occur: the food deficient in fat not only fails to nourish the child, but fails to develop the function of the pancreas for the digestion of fat at a later period of life; the craving of the child due to the deficiency of assimilated fat is met by starchy food, which it has not the power to digest, and which, if digested, can-

* See some excellent papers by Dr. D. J. Brakenridge, "On the influence of a Digestive Habit, &c." *Medical Times and Gazette*, June, 1868.

not supply the place of fat. Thus it is literally starved from first to last of those elements of nutrition especially essential in early life. We cannot, therefore, be surprised that such cases have proved obstinately fatal, neither is it anything but what one might expect, *a priori*, that they get rapidly well when Pancreatic Emulsion of fat is added to their diet, for by this means they are enabled to assimilate both fat and starch.

Certainly, of all the satisfactory remedial effects of Pancreatic Emulsion, none equal the almost magical recoveries of some of these miserable wasted children. The cases in which I have seen it administered within the last eight years are too numerous to relate, and I will only briefly mention three of those which first especially excited my attention.

1. A poor woman came to the Royal Hospital for Diseases of the Chest with a child presenting the most exaggerated features of emaciation of every part, except the abdomen which was large and hard. She was very excited at having succeeded in gaining admission, and explained in great haste that "all she wanted was some Pancreatic Emulsion, which she had learned could be obtained at the Royal Hospital." She said the child had been even worse than I saw it, that everybody told her it was a hopeless case, and that she had carried it to her mother's home in the West of England, where it appeared to be slowly dying, when a charitable visitor came in and gave her a bottle of emulsion, saying that he had seen just such a case cured by it. She gave the emulsion, and the child began to improve so wonderfully that she was able to bring it back to London, where it continued to mend till her bottle of emulsion was finished, when it rapidly fell back, and became nearly as bad as ever, before she could find out where to procure more of

the remedy. This she had just done, and hurried off to the Hospital. The child had diarrhœa, but she said she knew that would stop if I gave her emulsion, as it had done so before. I did as she asked—let her have as much emulsion as she wished, and the child got absolutely well. I have seen it this year, a well-grown, plump, hearty little girl. This woman has since had two other children, each of whom has in turn shown signs of marasmus like its elder sister; in one, when brought to me, the lungs presented small crepitation from end to end; but both of these children were put upon emulsion at an early stage of their wasting, and made easy recoveries.

2. Soon after these cases occurred, Dr. Dingley, of Argyll Square, consulted me about a little patient of his in Soho, who was wasting in the same way; and as all the usual remedies, both in medicine and diet, including cod oil, had quite failed to arrest the downward progress of the case, we agreed to try the Pancreatic Emulsion. I did not see the case again, but Dr. Dingley has since informed me that from the time of commencing the Emulsion the child began to improve, and steadily progressed till it got perfectly well; and it remains well to the present day. Dr. Dingley was so impressed with the success of the remedy in this apparently hopeless case, that he tells me he has since resorted to the same treatment in all similar cases with equally satisfactory results.

3. At the Oxford meeting of the British Medical Association, Dr. Langdon Down told me of a case that had made a great impression upon him, and it is especially important as coming from a man of his large and intimate experience in all that relates to the affections of childhood. The following note from Dr. Down graphically indicates the outline of the case:—

“The patient at Reigate was seen by me in consultation with Mr. Steele, in the spring of 1867. She was in the most attenuated condition I ever remember seeing. It appeared to be the extreme marasmus of mesenteric disease. The lungs were healthy. The treatment had been most judicious and exhaustive. As something which had not been tried, I suggested the Pancreatic Emulsion. The improvement was coincident with the altered treatment and was very progressive. Five months after I was asked to see her by her father, to test whether I could recognise her. She was playing croquet, and I could hardly believe that the one pointed out to me was our patient, the change was so great. She has ever since had excellent health.”

These cases, which are well known to many persons besides myself, may appear somewhat “sensational,” but they are only samples of numerous others which have occurred in my own practice. The fact is, that when these cases are properly selected for the treatment, they are all “sensational;” for the rapidity with which it takes effect, and the completeness of the restoration to health of children who appeared to be hopelessly dying, is simply startling.

I have proved over and over again that, whether in children or adults, no amount of milk or cream, however good, will do instead of Pancreatic Emulsion, and I have tried to discover why this should be. Milk, so far as this part of its composition is concerned, is simply an emulsion of fat; and pancreatic emulsion, as I have shown in the paper to the Royal Society already referred to, is not, as formerly supposed, a chemical combination, but a true emulsion. Why, then, does not milk answer as well? I believe the explanation to be very simple, and that it turns upon the following points:—

1. The fineness of the particles of fat, and the absence of albuminous envelope.

2. The permanent character of the molecular mixture of fat and water.

3. The proportion of fats having high melting points.

(a) In my first paper on Pancreatic Emulsion ("Lancet," September 10, 1864), I gave the measurements (made by the late Mr. Farrants, President of the Microscopical Society) of the particles of fat in cod oil and beef fat emulsions, as then prepared for me; showing that the majority of the particles in the cod-oil emulsion ranged from the 16,000th to the 1,200th of an inch in diameter, and those in the beef-fat emulsion from the 10,000th to the 2,500th of an inch; and, according to Bowman ("Practical Handbook of Medical Chemistry," p. 174), "The size of the globules in healthy milk varies from a mere point to about the 2,000th of an inch."

Since I published Mr. Farrants' measurements, pancreatic emulsion has been made by a much more equal and satisfactory process than at that time, and I have just examined a chance specimen procured from Messrs. Savory and Moore, in which the large majority of the particles of fat range from the 21,600th to the 14,400th of an inch in diameter, the prevailing size being the 18,000th of an inch; while in a specimen of good new milk (cold), which I have also just examined, the large majority of the particles of fat range from the 7,200th to the 3,600th of an inch in diameter, the smallest being the 10,800th.

(b) The permanent character of the Pancreatic Emulsion is very remarkable, far exceeding that of milk. It "differs entirely from all other kinds of emulsion of fatty matter, whether chemical or mechanical. All other emulsions of fat are destroyed by ether, the fat being restored at once to its original condition. The influence exerted

by the pancreas upon fats, therefore, appears to operate by breaking up the aggregation of the crystals of the fat. It alters the molecular condition of the fat, mingling it with water in such a way, that even ether cannot separate the fat from the water. A *permanent emulsion* is thus formed, ready to mix with a larger quantity of water whenever it may be added." ("Proceedings of the Royal Society," already referred to).

(c) In the "Chemical News," September 4, 1868, I stated my reasons for believing in the importance of fats of high melting points, such as stearine, margarine, and palmatine, over those of low melting points, such as oleine, as elements of food and medicine; although further experiments and investigations are still needed on this interesting subject. (See p. 108).

Pancreatic Emulsion of solid fat, consisting principally of stearine, margarine, and palmatine, is therefore quite a different thing from milk, the fat of which is principally oleine.

Now, the nearest approach to a pancreatic emulsion is what may be called *nascent milk*, by which I mean milk just secreted—milk that flows from the mammary gland as it is formed, or, as mothers term it, "as the draught comes in." In this the emulsification is finest and most perfect, but every minute that elapses after the milk is secreted deteriorates this perfection of emulsification, until, as we know, whether retained in the lactiferous ducts or in an artificial vessel, but especially in the latter, and when allowed to cool, the cream separates from the water of the milk, never again to be susceptible of the same emulsification with water in which it first existed, *except under the influence of pancreatic juice*.

I submit that this is the secret of the superiority of lactation, and especially of lactation at the time "the draught

comes in," over every other kind of infant-feeding, whether in man or in the lower animals. It forms an important distinction between milk-diet, supplied by the natural process of suckling, and milk-diet administered artificially, and affords some reasonable colour to the old-standing belief in the efficacy of "new milk warm from the cow" for delicate children, and to the remarkable recoveries recorded in ancient times of old persons nourished by lactation when everything else had failed.

CHAPTER VI.

FERMENTED LIQUORS.

ADMINISTRATION OF ALCOHOL—PROPERTIES OF VARIOUS WINES
—WINES IN GENERAL—SPANISH WINES—GERMAN WINES—
HUNGARIAN WINES—GREEK WINES—ACID, GOUT, RHEUMA-
TISM—ACID AND SUGAR IN SPIRITUOUS LIQUORS—ARDENT
SPIRITS AND THEIR PECULIARITIES—ALCOHOL TABLE SHOW-
ING THE ANALYSIS OF SPIRITUOUS LIQUORS.

ADMINISTRATION OF ALCOHOL.

According to my own experience, based upon long and careful observation, an average-sized adult man taking moderate exercise may drink with advantage enough fermented liquors, each 24 hours, to represent from one to two ounces avoirdupois of *absolute* alcohol equivalent to from $1\frac{3}{4}$ to $3\frac{1}{2}$ ounces of proof spirit*—provided it be always diluted to the extent of 10 fluid ounces (half-a-pint imperial) of water or some other unfermented liquor to each ounce avoirdupois of *absolute* alcohol, and that it be taken when there is food in the stomach. (See “Preliminary Remarks;” Chapter III.; and Appendix).

THE PROPERTIES OF VARIOUS WINES.

The subject of wine has of late years become so extensive—embracing so many considerations connected with such numerous varieties of wine from different parts of the

* See Alcohol Table.

world,—that I have thought it best to give the practical experience of several recognized authorities specially acquainted with different departments of the subject.

I am glad, therefore, to be able to present the following matter from such reliable sources.

The observations on *Wines in Général* are dictated by my friend Mr. James L. Johnston, late Principal Inspector of Customs Laboratories, who has, undoubtedly, more correct practical and scientific knowledge of fermented liquors than any other person in this country.

For the account of the wines of Spain I am indebted to Mr. F. W. Cosens the celebrated Spanish wine merchant.

The description of the Wines of Germany and of the distinctive medicinal properties attributed to them in the districts where they are grown, has been kindly furnished by Mr. M. A. Verkrüzen of Fell Street, City, who is well known to have devoted much time to this subject.

Mr. Deuman, of Piccadilly, the principal introducer of the Wines of Greece, and the author of several works on wine, has favoured me with the concise statement of the medicinal properties attributed to these wines by the numerous medical men who have communicated to him their experience.

For the account of the wines of Hungary I am indebted to Mr. Max: Greger of Mincing Lane, City, who first introduced the pure Hungarian wines into this country, and who has so creditably maintained his character both for a scientific and practical knowledge of the wines of his native land, and for the conscientiousness with which he attends to the orders of medical men, when they consider it important that only the purest and most mature wines shall be supplied to their patients.

I give the statements of these several authorities nearly in their own words, and they are responsible for them ;

but, so far as it is practicable for one person to do so, I have endeavoured to test the correctness of their opinions by my own experience.

I have only further to add, that there is no department of commerce in which "commercial immorality" is so atrociously and so easily practised as in the wine trade, the most professed connoisseurs being often the most "taken in;" and, that I know of no protection against the misfortune of drinking half poisonous trash instead of genuine wholesome wine, except that of cautiously selecting a wine merchant of known honour and probity, and then leaving to him the entire responsibility of choosing your wines.

WINES IN GENERAL.

In the economy of nature, wine has always held a prominent position. Corn, and wine, and oil, represent the highest agricultural development of the vegetable world—the corn and oil to nourish and sustain, and the wine to invigorate, refresh, and solace life.—In considering the subject of diet, therefore, whether for health or sickness, so important an element cannot be ignored; seeing that, while in health it contributes largely to the enjoyment of life, in sickness it is a powerful auxiliary to the Physician, more particularly under certain morbid conditions affecting both body and mind. In all ages, in wine-producing countries, especially, where it is best known and appreciated, wine, *rationaly used*, has been regarded as a valuable means of promoting health, of prolonging life, and of adding to its enjoyment; but the penalties which follow the *abuse* of any of those gifts, provided and intended, by the Creator for the benefit of his creatures, as certainly

follow its *misuse*. This requires no argument to demonstrate, it is within the knowledge of every thinking observer, nor does it furnish any reason for the *disuse* of wine, for there are few of the most valuable medicaments which are not poisonous if used without discretion. With these prefatory remarks I will proceed to consider briefly the constitution and varieties of wine, its natural and commercial alcoholic force, and its hygienic properties.

Strictly defined, wine is the fermented juice of the grape. But this theoretical definition is not quite carried out in practice. When perfectly fermented, wine becomes what is technically termed "dry," meaning that the whole of its sugar has been converted into alcohol, within certain limits, however, inasmuch as the production of alcohol, at a certain point arrests the fermentation and further production of spirit, leaving a margin of unconverted sugar (where that constituent is in excess) to enhance the richness of the wine, as in the instance of the celebrated Sauterne known as Chateau D'Yquem. For the same reason extraneous spirit added to the fermenting "must" has the effect of arresting further action, and retaining the unconverted sugar as an element of richness in the liquid. This is the course followed, with recent modifications and exceptions, however, in the manufacture of the Port wine of commerce, and also of the red Tarragona wines of Spain intended to imitate and compete with Port in the English market.

Some wines are only partially fermented, in consequence of the over-richness of the "must" through the elimination of a considerable proportion of its watery constituent by natural or artificial means; as in the instance of the Essenz or Ausbruch wines of Hungary of which the Imperial Tokay, a wine of wonderful richness, is the highest type. Others again are not fermented at all, but the

grape juice is simply inspissated or concentrated by slow boiling or simmering, as in the Tent wine made at Rota in Spain, and used generally for communion purposes in the Anglican Church. Of course under such circumstances this is merely a syrup or conserve of grape juice, and does not contain a particle of spirit in its natural state ; but as it is customary to add from 20 to 30 per cent. of spirit to it by way of preservative, it is put upon much the same footing as fermented wine, in respect of alcohol.

Effervescing or sparkling wines are the last variety. In them the fermentative action is not only arrested but imprisoned as it were, to form the "mousse," as it is called, which is at once their peculiarity and their charm.

Dry wines, whether still or sparkling, are preferable to all other kinds from a medical point of view, chiefly on account of their greater freedom from the objectionable unconverted sugar and their more easy digestion, in addition to which their quality is invariably higher, as being under no disguise.

In almost every other respect the grand characteristics of wine are common to all, subject to certain modifications arising from climate or soil, from the latter of which, especially, some very important hygienic qualities are derived.

Colour is a distinction of little importance to the present question ; it is obtained from the skin of the grape, when the bruised fruit is fermented in place of the expressed juice ; red or violet when the black grape is used, from the blue colouring matter of the skins, and brownish-yellow in the case of the white grape, from the apothema, which becomes darker by exposure to the air. But in many cases colour is an artificial production, notably in the case of brown sherries, in which it is owing to an admixture of boiled wine called *vino de color* ; the normal

colour of pure sherry, for example, is a pale greenish or brownish-yellow, deepening with age. For these reasons pale sherries are to be preferred to golden or brown, especially as being purer.

The natural strength of wine is, within a limited range, from 18 to 30 per cent. proof spirit* (10·5 to 17·25 alcohol) which is rarely if ever exceeded. French Claret is a type of the lowest, and the wines of the Pyrenees Orientale and Spain generally, of the highest strength.

The majority, however, occupy the middle place, and comprise Sauternes, Burgundies red and white, the wines of the Rhine, the Moselle and the Danube, the Italian Peninsula (except Marsala) and the Grecian Archipelago, which are all within 20 and 25 per cent. proof spirit (11·5 to 14·5 alcohol). These wines, as a rule, are brought to market in a nearly pure state, or with such inconsiderable additions of spirit as to be of little consequence.

It may be taken for granted that no sparkling or effervescing wines can ever exceed the strength of 24 per cent. proof spirit (13·5 alcohol); their real variety, apart from the different sorts of wine employed, consists in the different proportions of sugar added as "liqueur" in the course of manufacture, and which varies from the pure or "brut" wine up to 18 and 20 per cent., the general average in the English market is midway, about 10 per cent., although the demand for the "dry" kinds is greatly on the increase. In prescribing these wines therefore the medical man is dealing with known forces as far as alcohol is concerned; but it is very different in respect of Port, Sherry, Madeira, and Marsala.

The Port wine of commerce is never under 35 per cent. proof spirit (20 alcohol), the average being 38·5 up to 42

* Proof spirit is the ordinary potable spirit of commerce and is equivalent to nearly equal parts of alcohol and water.—(See Alcohol table).

proof spirit (22 to 24 alcohol) ; while Sherry, Madeira, and Marsala, although commencing a trifle lower, or at about 31·5 proof spirit (18 alcohol) advance almost if not quite as far.

Thus a rich vintage Port wine at 42 per cent., the usual strength of high-class Port wine, must have had 33 per cent. of proof spirit, or $\frac{1}{3}$ of its bulk of ordinary brandy added to bring it to that condition.*

The same may be said of the cheaper red Tarragona wines, lately introduced, which bid fair to supersede the real Port wines in Hospital practice. In its pure state this is a generous wine of considerable natural body and strength, and likely, if its use were encouraged, to become a favourite and wholesome beverage with the million.

Although Sherries and other white Spanish wines are largely fortified, in general, for the English market, there are, amongst the drier sorts, Montilla, Amontillado, Manzanilla, and the lighter kinds termed *Vino de pasto*, many which would only be injured by being fortified, and are consequently—the higher classes in particular—usually exempt from that debasing operation. Some of these are unequalled for sanitary purposes, especially in dyspeptic cases where the bitter principle (in Amontillado not unlike that of an orange-pip) appears to act as a tonic.

No wine has been so extensively imitated—the usual penalty of admitted excellence—as so-called Sherry ; Hamburg especially is *facile princeps* in manufacturing an article called Elbe Sherry, largely recommended in certain quarters, composed principally of Elbe water and potato-spirit flavoured in an ingenious manner with various extracts and ethers too numerous to mention, but which

* Three glasses of such wine, therefore, represent more than one glass of ordinary Brandy.

should be shunned as poison under whatever auspices it may present itself. There is scarcely a white wine vended which is not called Sherry and courts consumption under that popular and attractive pseudonym.

It would be out of place in a work of this description to show the different means by which the natural characteristics of wine are artificially heightened, when weak, or supplied, when altogether wanting—such as the elder flower on the Rhine and Moselle, the chamomile in Spain, and the black currant leaf and rasp-berry in France to give “bouquet,” the elder-berry, blackberry and bil-berry to give colour, in Portugal and Spain. These are harmless, compared with the abominably pernicious practice of “fortifying” beyond what is necessary for purposes of preservation, where potato or beet-spirit, or some such cheap and nasty production is the agent employed.

SPANISH WINES.

Of all those wines possessing distinct characteristics, and which impress the palate in a marked degree, none is more prominent, in the opinion of Mr. Cosens, than that one of Spanish growth, known under the generic name of Sherry, and which is so-called from being produced near the town of Jerez de la Frontera in Andalusia, around which cluster the oldest and most famous vineyards.

Of late years since railway communication has opened up the interior of Spain to the seaboard, a great impulse has been given to viticulture around Seville, the Montilla district near Cordova, and other outlying localities; the wines being light, genuine, and delicate, are in general favour as dinner beverages at moderate prices.

The area producing the veritable Jerez has been somewhat extended, since Dr. Gorman, in 1851, published his statistical tables of the annual yield which he gave as 52,000 butts for the whole district.

There is, probably, little doubt that the famous "Methuen treaty," while it secured a temporary monopoly for the wines of Spain and Portugal, induced a much more careful cultivation, and consequently a yield of superior wine; so much so, that since then Sherry has become a household wine as much by force of quality as by fiscal favouritism. Of course the usual penalty of excellence has to be paid, and Cape and Elbe Sherries have started into notoriety as cheap imitations, damaging the reputation of the pure produce of Jerez, in the estimation at least of the ill-informed.

From old records still preserved amongst the archives at Jerez, we find that so early as 1268 vineyards are named as existing contiguous to the "Cartuja monastery" on the banks of the Guadalete which flows past the Portal, or Port of Jerez, a short distance from the town itself. It is also stated that in the year 1483, "no English or Breton ships have arrived this year in consequence of the war with the Biscayens," and in an old print of the time of the sack of Cadiz under Essex, men are seen carrying butts of wine slung by ropes suspended from their shoulders, to a boat on the beach, a vessel apparently of English build, lying at anchor in the Bay, the casks are of precisely the same shape and character as those now in use.

There is no doubt that prior to 1483 the wines of Spain were consumed and appreciated in England. In 1419 William Horrold was placed in the pillory for counterfeiting and vending "olde and feble Spaynishe wyn for good and true Romeney."

This same counterfeiting, for a long period fostered by the half duty charged upon Cape wines, has no doubt led many medical men into error as to the exact hygienic effects of Sherry.

Judging from continental practice there are many maladies for which genuine and generous wine of the Sherry type is the only recognised and approved curative stimulant.

A large quantity of really superior Sherry finds its way annually into consumption in England, in fact all the costly and rare growths are exported to this country.

Domecq, Garvey, Gonzalez, Cosens, and others, devote themselves almost exclusively to the growing, rearing, and exportation of the produce of the oldest and best cultivated vineyards of the "*termino* of Jerez." These wines can be procured in a perfectly genuine state, and in the highest perfection, through the established channels of supply—wine merchants of credit and position.

Undoubtedly, good, sound, wholesome, young Sherry may always be procured at a moderate price; but those who look for high character and rare excellence must bear in mind that great resources are required to enable the shipper to breed fine wine; much time, skill, and patience, as well as technical aptitude are absolutely necessary to secure a favourable result. Fine Sherry must, therefore, always remain more or less costly; at the same time excellent wine may be procured at a moderate price, while "cheap and wholesome," is only, as a rule, another name for dear because inferior.

A teaspoonful of water in a glass of ordinary Sherry, will render it grateful to the delicate digestion of most dyspeptics.

The great rage for cheap wines since the introduction of Claret at a low duty, has undoubtedly stimulated the

importation from the South of Spain of immature wines; such, improperly fermented, carelessly prepared, and of inferior growths have disgusted many consumers; and the medical profession have noted their baneful effects from a hygienic point of view.

Ford says in his Handbook, speaking of Manzanilla, "drink it ye dyspeptics," but as there are wines and wines, so are there Manzanillas and Manzanillas, no wine requires more time and skill to grow and rear, or, probably in its immature state, is more injurious to a delicate stomach.

A great deal of controversy has at times arisen as to whether the sprinkling of grapes with a very small quantity of gypsum is desirable or not; some assert that the lime in the sack, so feelingly alluded to by Falstaff, arose from this same sprinkling, especially as there is but little doubt that up to the early years of the 18th century, the "Sherris, sack" of history was quite a new wine exported from Spain almost as Must; hence all the empirical recipes given in such books, as the mysteries of Vintners" (1699), &c.

With reference to this sprinkling of gypsum practised since the days of Pliny, its sole use is probably to counteract the effects of an over-production of albuminous matter dangerous to the wine during the years required to ripen and perfect it.

Genius in the management of Sherry has its value, undoubtedly, but it must be supplemented by training.

Condition, time for bottling, refining, all these require long and patient study; the result being, from skill and good management, bottled sunshine, and, from the contrary, Daffy's Elixir!

The Red wines of Spain are annually gaining favour, they are ripe at an earlier age than the White and possess

dietetic and hygienic properties peculiarly their own. At the Claret duty of 1s. per gallon instead of 2s. 6d. they would probably become the Red wines of the million.

GERMAN WINES.

German Wines when obtained in their native purity contain medicinal and health-promoting qualities of great value.

Foremost in medicinal respects, Mr. Verkruzen says, we should consider the Moselle and Saar Wines; they are the lightest and contain the smallest proportion of alcohol and Saccharine matter, and are consequently not only the most digestible, but, from the considerable proportion of vinous and apple acid they contain, are powerful promoters of digestion; they act most beneficially upon the secreting and excreting organs and are great purifiers of the blood; whilst their stimulating power is of the mildest character, though most decidedly perceptible, as in the coldest weather they diffuse throughout the system a comforting sense of warmth.

Dr. Franz Meurer, Royal Prussian Resident Physician by Government appointment at Zell on Moselle, speaks in the highest terms of the curative and health-promoting qualities of these wines, as the result of his thirty years' practical experience.

He recommends them as most valuable in cases of Rheumatism, Gout, Dropsy, Stone, Gravel, Scorbutic and blood diseases generally.

In certain cases those younger and lighter wines which possess a larger proportion of vinous and apple acid are most beneficial; whereas, in other cases, fuller bodied

wines of greater age and possessing a larger degree of alcohol (*always natural and not added to the wine*) and a less proportion of acidity, of whatever nature it may be, are most beneficial. It is a noteworthy fact that the Moselle and Saar wines, whilst containing more vinous and apple acid than other wines, not only do not sour the stomach like the sweet wines but actually counteract acidity of the stomach by promoting its healthy action.

In cases where Ports, Sherries, Clarets and Rhine wines produce acidity, the Moselle wines frequently counteract it from the extraordinary lightness of their character and the mild and gentle nature of their appetising power, which gently stimulates without irritating. As daily beverages no wines are more suitable. The higher class of these wines are the most recommendable in dyspeptic cases.

The principal growths are:—

Wiltinger, Zeltinger, Brauneberger, Piesporter, Josephshöfer, Grünhäuser, Scharzberger and Scharzhofberger, *all white wines*.

These may be described as strongly diuretic and mildly laxative; the higher class, containing the least amount of acidity, might be considered, perhaps, sedative, as they are wonderfully composing and comforting.

The Rhine and Palatinate wines, are of a stronger and more spirituous character than the Moselle and Saar wines, and consequently are more generous, yet amongst these there are many equally light and similarly refreshing.

Excepting in the case of the lighter sorts, we should recommend greater moderation in the enjoyment of these than of the Moselle wines.

Amongst the finest white growths are the following:

RHEINGAUER.

PALATINATE.

MARCOBRUNNER, (light and very wholesome, diuretic).	DEIDESHEIMER, (fine, full, rather sweet wine).
RUDESHEIMER, (full-bodied stout wine, generous).	FORSTER, (soft delicate wine, delicious bouquet).
JOHANNISBERGER CABINET, (fine, aromatic wine).	RUPPERTSBERGER, (very fine full-bodied wine, frequently almost spicy).
STEINBERGER CABINET, (very fine grand wine, full-bodied).	

To say that any of the wines just named are specially diuretic, laxative, sedative, tonic, &c., would be hardly to represent them correctly, as they all possess these qualities more or less according to the quality, vintage, age, &c., &c., &c.

There are twenty or more distinctions of quality to be had in each growth, containing more or less alcohol, saccharine, vinous acid, fixed acid, volatile acid, tannin, &c., &c., according to the nature of the host of circumstances which have operated upon the production of the wine from the commencement to the completion of the process, and which differ with every season.

When invalids require wines for certain cases and objects they ought, after having consulted their medical adviser as to the nature or character of the wine that suits their case, to entrust their order to a wine merchant who understands his business and who is thoroughly conversant with the nature of the different wines constituting his stock. As a *sedative* he will give them a fine dry clean old neutral wine, no matter whether a Deidesheimer or Forster; as a *diuretic* he will give them a wine containing much vinous and fruit (apple) acid; as a *stomachic* he will select a wine having a considerable proportion of tannin; and to the *low spirited and down-cast* he will give a fine wholesome dry and sparkling wine.

Amongst the Red Wines of Germany we have several excellent sorts, suitable especially for convalescents and as family wines. Assmannshäuser and especially *Oberingelheimer* from the Rhine, and the fine Walporzheimer wines from the valley of the Ahr, are fine stomachic wines and great blood enrichers; in anæmic and other constitutions exhausted by debility, and also in persons of the phosphatic diathesis these wines are recommended.

Of the Sparkling wines of Germany, a pure Moselle, without muscatel and other artificial flavouring, is the most wholesome, and in cases of weak digestion I should consider such a wine decidedly preferable to Champagne. I have seen wind on the stomach which had almost constantly troubled the sufferer for three or four weeks to an alarming degree, entirely and effectually cured (so that during three weeks subsequently no recurrence whatever of the malady was perceived) simply by the use of a bottle of fine sparkling Moselle and $\frac{1}{2}$ lb. dry, hard, short, biscuits taken about four hours and a half after luncheon; the stomach was gently brought into action by the wine and biscuits, the wind was expelled, the whole frame became warm through, and a sense of extreme comfort ensued. By gently acting upon the stomach, and subsequently upon the bowels, liver, and kidneys, the wine no doubt removed to a great extent the causes which produced the wind and hence the relief experienced for so long.

When fatigued, especially in hot weather, there is no better reviver as a glass of half soda water and half still Hock or fine Moselle.

HUNGARIAN WINES.

Mr. Max: Greger says, he can speak with the utmost confidence of the medicinal properties of the different

kinds of Hungarian wines, not only from many years of personal experience in the districts where they are grown, but from reports that have been forwarded to him, in some hundreds of letters, by medical men who have prescribed these wines in their practice.

In prescribing Hungarian wines, it must be borne in mind that they are far richer in grape-sugar, and in consequent alcohol, than any of the French and German wines, they therefore require a year or two longer to finish fermentation, that is to say to accomplish their maturity. It is, therefore, of the greatest importance to obtain these wines from such sources as may leave no doubt that they are first, *genuine*, and secondly, *matured*.

Hungarian wines, generally speaking, are full in body, and whilst most other cheap light wines will produce a feeling of coldness, a glass of good Hungarian wine will produce a sensation of warmth all over the body.

In anæmia and chlorosis, and in exhaustion from loss of blood, especially by women after childbirth and in chronic nose-bleeding, great benefit is derived from the use of the Hungarian Red wine, Carlowitz. It is also administered with advantage in bilious disorders, sluggish action of the liver and hæmorrhagic affections.

Ofner Auslese is prescribed with excellent effect in diarrhoea, and if the case is urgent half an ounce of cinnamon and an ounce of cane sugar are added to one bottle of wine, which, if well boiled together for half an hour and taken hot at bed time, will produce a very agreeable soothing effect on the bowels. In Hungary, Ofner Auslese is the household remedy for diarrhoea, especially during cholera epidemics.

Amongst the white wines of Hungary, Somlau should be selected as a substitute for the, so-called, dry sherries of Spain; and Edenburg and Ruster Ausbruch (dry),

where the tartaric acid contained in all red wines seems objectionable.

The Ruster is especially valuable in convalescence from exhausting diseases, sleeplessness and weak digestion, and in Hungary is considered a valuable sedative in neuralgia; while the Edenburg finds especial favour with gouty persons, many of whom have been unable to touch any other kind of wine. It has distinctly diuretic properties attributed to it.

The different kinds of Hungarian sparkling wines, are pleasingly exhilarating, leaving but little after depression even when they have been taken to excess. They, therefore, constitute a satisfactory stimulant where exhilaration rather than alcoholic stimulation is desired.

The finest Crown Tokay is an extraordinarily restorative wine, spreading warmth throughout the body to the tips of the toes and fingers, and is therefore of singular value to the old and feeble. It is, however, very rarely found of genuine quality, and when genuine is of great cost.

GREEK WINES.

The following are the leading properties, in a Dietetic point of view, attributed to the wines of Greece.

WINE.	COLOUR.	PROPERTY.
St. Elie	White	Stimulant and exhilarating.
Thera	White	Restorative and supporting.
Santorin	Red	Tonic and restorative.
Kephesia	Red	Astringent and blood-making.
„	White	Refreshing and gently stimulating.
Patras	White	„ „ „
„	Red	Tonic and stimulant.
Como	Red	Restorative and nutritive.

ACID, GOUT, RHEUMATISM, FROM FERMENTED LIQUORS.

The question most frequently requiring consideration with regard to the selection of alcoholic beverages, is their tendency to encourage acidity and to promote gout or rheumatism. For practical purposes, these three questions may be merged in the second, viz., their gouty or non-gouty tendency.

From long and careful consideration, both theoretically and practically, of the production and composition of fermented liquors and their effects upon digestion and disease, I have come to the conclusion that alcoholic drinks favour the tendency to gout, or actually produce it, in proportion to the quantity they contain of saccharine and albuminoid ingredients in which the processes of fermentation and decomposition have commenced but have remained uncompleted. This head will especially include those full-bodied "fruity" wines, in which the course of fermentation has been stopped by added spirit, or in which it is incomplete from want of age; (see p. 126), and malt liquors and cider, in which the process of fermentation is never thoroughly completed by the time they are considered in good condition for drinking.

The least gouty alcoholic drinks, are those spirits in which no unfermented compounds are present, and those wines in which vinous fermentation has become complete. But unfortunately these wines cannot be borne by acid *stomachs*, because complete fermentation of wines involves the production of much acid. If they are taken, therefore, they must be mixed with enough alkaline mineral water to neutralise their excess of acid.

It is important to remember that although a fluid may *contain* much acid, and therefore be unfit for some sto-

machs, it will not *generate* acid if it is free from saccharine matter ; whereas a fluid containing saccharine matter will generate acid although it may not contain any.

ARDENT SPIRITS AND THEIR PECULIARITIES.

Brandy makes people nervous, Gin weakens, Rum and Whiskey produce biliousness, Whiskey is the least objectionable. When Whiskey produces biliousness, Rum, which has been made hot and then cooled, may be tried instead.

The prominent objection to all ardent spirits, is, that they injure the lining of the digestive canal, and produce diseases of the liver and kidneys. The best means of preventing these dangerous effects, is, *free dilution* with some unfermented liquid. None should be taken neat, and when mixed with water or other fluids they should be well incorporated by pouring many times from one vessel to another ; otherwise, the unfermented liquid will be separated from the alcohol in the stomach, and the objects of dilution will be frustrated after all.

ALCOHOL TABLE.

The weight of Absolute Alcohol (spec. grav. 793 at 60° Fht.) and of solid dissolved, in measured quantities of Spirituous Liquors.

SPIRITUOUS LIQUORS.		* * This column shows the quantity by measure of each Spirituous Liquor which contains ONE OZ. AVOIRD. of absolute Alcohol.	1 oz. avoird. of Carbon is contained in fluid ozs.	One Imperial Pint contains		Per cent.		
		Fluid oz.		Extract.	Carbon.	Extract.	Alcohol.	Equivalent of proof spirit.
				— ozs. avoird.	— ozs. avoird.			
ARDENT* SPIRITS.	(Proof Spirit)	2'26	4'3	—	4 6	—	57'15	100
	Whisky	2'6	5'0	1	4'0	0'6	48'3	84'5
	Brandy	2'7	5'0	2	4'0	1'2	47'1	82'4
	Rum	2'8	5'3	2	3'8	1'1	45'0	78'8
	Gin (sweetened) . . .	3'2	5'5	9	3'6	4'5	39'8	69'6
WINES.	Port	6'9	10'2	1'1	2'0	5'5	22'0	38'5
	Lisbon (White) . . .	9'0	7'8	3'5	2'6	16'1	12'0	21'0
	Bucellas	7'3	11'2	0'9	1'8	4'4	16'0	28'0
	Madeira	6'8	11'0	0'7	1'8	3'5	22'0	38'5
	Sherry (of commerce)	6'5	10'0	1'0	2'0	4'6	20'6	36'0
	„ Montilla and } Amontillado }	6'8	10'1	1'1	2'0	5'6	18'3	32'0
	„ Natural	9'0	7'8	1'5	2'6	5'2	14'5	25'3
	Marsala	7'5	11'7	0'9	1'7	4'4	19'5	34'0
	Rousillon (Masdeu). .	6'3	8'5	1'7	2'4	8'0	20'6	36'0
	Burgundy	15'2	23'8	0'4	0'8	1'8	12'0	21'0
	Chablis (Montrachet)	19'0	27'0	0'5	0'7	2'3	12'0	21'0
	Claret	16'3	23'4	0'5	0'8	2'5	11'5	20'0
	Sauterne (Chateau } d'Yquem }	9'0	7'8	3'5	2'6	16'1	12'0	21'0
	Hock (Johannisberg)	13'4	20'4	0'5	1'0	2'5	12'0	21'0
	Moselle	15'2	23'3	0'4	0'8	2'0	12'0	21'0
	Champagne and } other effervescing or sparkling wines }	12'6	11'3	2'3	1'8	11'0	13'5	23'6
	Hungarian Red } (Carlowitz) }	14'1	21'2	0'5	0'9	2'5	14'5	25'3
	„ White } (Somlau) }	19'0	28'3	0'4	0'7	1'8	12'0	21'0
	„ Imperial } Tokay (essenz) }	9'0	7'8	3'5	2'6	16'1	10'3	18'0
	Constantia (Red } and White) }	9'0	7'8	2'8	2'5	15'0	11'5	20'0
	Frontignac	9'0	7'7	3'4	2'4	15'8	10'3	18'0
CIDER.		64'0	40'0	0'8	0'6	3'7	5'2	9'1
MALT LIQUORS.	Ale, Burton, Bass, 84s.	12'5	9'0	3'4	2'2	15'7	10'1	17'6
	„ „ „ 60s.	14'2	13'0	2'0	1'5	9'6	8'9	16'6
	„ „ „ 60s.	19'0	17'5	1'5	1'1	7'0	6'6	11'5
	„ India (Gardner, } X 54s. }	23'0	28'0	0'6	0'7	3'0	5'5	9'6
	„ Bottled { Scotch } { Edin. }	19'0	13'1	2'4	1'5	11'4	8'0	14'0
	„ „ { Pale }	25'0	20'5	1'4	1'0	6'6	5'0	8'7
	„ „ Eightpenny . . .	22'7	22'2	1'1	0'9	5'4	5'7	9'9
	„ Family 1s. gallon .	24'9	22'0	1'2	0'9	5'7	5'4	9'4
	„ „ Fourpenny . . .	25'4	23'0	1'1	0'8	5'3	5'2	9'1
	Stout, Dublin, (bottled)	20'8	16'7	1'7	1'2	8'2	6'1	10'6
	„ „ London	21'5	18'9	1'5	1'1	6'9	5'9	10'3
	Porter, London	35'6	26'6	1'2	0'8	5'6	3'7	6'4

* 20 Fluid oz. = 1 Imperial pint (measure). 16 oz. avoird. = 1 pound (weight.)

CHAPTER VII.

DISINFECTION.

MEDIA BY WHICH THE CATCHING DISEASES ARE COMMUNICATED—
MEANS FOR PREVENTING INFECTION AND CONTAGION—DI-
RECTIONS FOR THE SICK ROOM AND ATTENDANTS—PRE-
CAUTIONS TO BE USED BY DOCTORS—MODE OF CLEANSING
APARTMENTS AFTER ILLNESS—PROPER METHODS OF USING
CHLORIDE OF LIME, CARBOLIC ACID, AND CONDY'S FLUID.

INFECTIOUS and Contagious (catching) diseases—Scarlet fever, Diphtheria, Small-pox, Measles, Typhus, Chicken-pox, Relapsing fever, Puerperal fever, Whooping-cough, Mumps, &c.,—are communicated principally by the following media:—

1. The breath.
2. The secretions and excretions.
 - a. The saliva.
 - b. The perspiration.
 - c. The urine.
 - d. The evacuations from the bowels.
 - e. The sputa.
3. The skin of the body; especially the dead peeling skin and the powdered skin which adhere to clothing and are wafted about in the air.
4. The body-clothes.
5. The bed-clothing.
6. Discharges from eruptions, abscesses, wounds, &c.
7. The hair.
8. The walls, floors, and furniture of apartments.

It is probable that no infectious or contagious disease would spread if all these media were promptly disinfected.

The difficulty lies, not in disinfecting any one of them when it is specially submitted to us, for that is easily done, but in keeping up such a rigorous system of disinfection around the sick person, that *none* of these media shall escape disinfection; for common sense tells us that if only one escapes, the protection from infection may be lost. It is evident that the disinfection of the secretions and excretions must be performed as they leave the body, so that the air may not be infected during their passage. For this reason the disinfectants put into spitting pots, urinals and bed pans should be *Volatile*, like Chlorine and Carbolic Acid, so that an atmosphere of the disinfectant may rise from the utensils while they are being used. I, therefore, advise for these purposes Chloride of Lime and water, or Carbolic Acid; and they have the advantage of continuing to give off their disinfecting principles after the contents of the utensils are thrown down the drains.

For most other purposes Condyl's fluid will suffice; it is clean, free from offensive taste or smell and not poisonous. It is not volatile but it disinfects whatever comes in contact with it. The air of a room, therefore, may be disinfected to a great extent by freely dispersing Condyl's fluid with a spray producer. Clothes can be disinfected by being soaked in it. The skin can be disinfected by being washed with it. Sponges can be disinfected by being soaked in it, but sponges are dangerous spreaders of infection, and it is much better to use pieces of cloth, which can be burnt, and in cleansing wounds to irrigate them with a syringe. Linen and other washing materials can be disinfected by boiling, but they should be previously put into Condyl's fluid or diluted Carbolic Acid directly they are done with and kept in it for about two hours, otherwise they may spread infection before they are boiled. For all

these purposes Carbolic Acid is most efficient but its smell is objectionable.

Whatever is not susceptible of boiling but will bear baking can be disinfected by being submitted to a temperature of from 212° to 250° in an oven, and for greater safety a little Carbolic Acid should be put into the oven at the time.

1. When a catching disease occurs in a house the first thing to be done is—to select a room for the patient as much isolated as possible from the rest of the house; a room through which no one has to pass and by which there are as few passers as possible; the top of the house is best as a rule. The room should have a window opening directly into the fresh air and an open chimney and fire-place, and it should be supplied with not less than 1000 cubic feet of fresh air every hour for each occupant whether patient or attendant. (See Chapter I. “Ventilation, &c.”) Whenever practicable a second room should be set apart, near the patient’s room, for the attendants to cook and take meals in and to sleep in when off duty.

2. The second thing to be done is—to remove from the room or rooms selected every thing that cannot be washed, boiled, baked or burnt, and then to hang over the outside of each doorway a curtain kept constantly wet with Condyl’s fluid.

3. The third thing is—to decide who is to attend upon the patient. There should always be two persons and no more. They should cover their hair with washing caps, dress in washing clothes, and not associate with the rest of the household or with any other persons. They should each take at least six hours sleep out of the 24. They should each walk out in the fresh air 1 hour per day. They should wash their hands and faces with Condyl’s fluid

and water when they leave the patient's room. They should avoid inhaling the breath or exhalations of the patient and they should neither eat nor drink in the sick-room.

4. The fourth thing is—to place in a corner of the patient's room a large glazed pan containing water and Carbolic Acid or Condyl's fluid. Into this pan everything that can be washed or boiled should be put, directly it is done with, before it leaves the sick-room. The pan should be emptied night and morning or oftener.

5. The patient should be sponged all over with warm water and Calvert's Carbolic Acid Soap twice a day (except during periods in which it may be thought unadvisable by the doctor); and if the skin is peeling or powdery it should be anointed after the sponging with olive oil containing a little Carbolic Acid (about 10 per cent).

6. Chloride of Lime and Water or Carbolic Acid should be put into every utensil before it is used by the patient, and after being used the contents should be immediately thrown down the drain, together with some fresh Chloride of Lime.

7. The patient's teeth and mouth should be washed with Condyl's fluid, or Calvert's Carbolic Acid Soap, and water several times a day, and when there is any discharge from the nose or other passages these should be cleansed in the same way. When the discharges from the body are foetid Savory and Moore's Carbolic Acid vaporiser should be burnt in the room.

8. It must constantly be borne in mind that no amount or kind of disinfection will take the place of fresh air, and therefore the sick-room must be kept freely ventilated, carefully avoiding draughts. (See Chapter I.) Gas should not be burnt in a sick-room.

9. The doctor should not communicate with any other

members of the household *after* he leaves the sick-room and he should always be provided with a basin of water, Calvert's Carbolic Acid Soap, a nail brush, and a clean towel, with which to wash his hands on leaving.

Let it be especially remembered that the main points are the prompt disinfection of the infecting media, enumerated in the beginning of this Chapter, and the free circulation of fresh air.

After the acute specific disease has run its course, infection may last as long as there are any unhealthy discharges left by the disease, as long as there is any peeling or powdering of skin, shedding of hair or the like; and precautions are needed for disinfecting these means of spreading disease so long as they exist.

No doctor who has been in attendance upon Erysipelas, Scarlet fever, Puerperal fever, Typhus, Gangrene, Pyæmia &c., or who has been engaged in a *post-mortem* examination should enter a *lying-in* room until he has subjected himself to effectual purification and disinfection; and it is a safe rule, under all circumstances, for a doctor not to touch a lying-in patient until he has washed his hands with some disinfectant.

The difficulties of carrying out this rule are very great in the hurry of practice, but every doctor engaged in Obstetric practice is bound to provide for doing so. And he should never go upon his rounds without some disinfectant with him to mix with the water in which he washes his hands in case of unexpected need.

To facilitate this important hygienic precaution, I have induced Messrs. Maw, the well-known instrument makers of 11 Aldersgate Street, and Messrs. Calvert the celebrated manufacturers of Carbolic Acid, to provide a little metal case containing a piece of strong Carbolic Acid Soap, a nail-brush, (for it is useless to wash the hands

without brushing out the nails) and a little tube of Carbolic Acid, for medical men to carry constantly in their pockets when on their rounds. The whole is no larger than a small snuff-box, and is called "THE POCKET DISINFECTOR." It ought to be used by nurses and visitors upon the sick, as well as by doctors.

When the infectious period of the illness is over and the patient removed from the sick-room—everything which has been used or worn by the patient and attendants having been either disinfected or destroyed as already directed—the room must be thoroughly disinfected in the following manner :—

1. The windows and doors being shut, the room must be kept full of Carbolic Acid fumes for 12 hours by means of one of Savory and Moore's Vaporisers—Then the windows must be opened for 12 hours before cleaners and workpeople are admitted.

2. The floors, paint, and furniture, must be washed with Water and Chloride of Lime or with Calvert's Carbolic Acid Soap. The ceiling and walls must be Lime-washed, after which the walls may be re-papered if required. While this work is in progress a fire should be kept burning in the grate and the windows open.

The following particulars as to the mode and proportions in which to use Chloride of Lime, Carbolic Acid, and Condy's fluid, have been kindly furnished by Messrs. Savory and Moore, and by Mr. Calvert.

For fumigation by Chlorides.—Dissolve one pound of the Chloride of Lime in 4 gallons of Water and, after stirring the mixture well, allow it to settle; pour off the clear liquor and place it in shallow dishes or other convenient vessels in the rooms and passages of the House.

For use in chamber-utensils, bed-pans, spittoons, &c., and where a volatile disinfectant is required, a wine-glassful of the above solution should be added to a pint of water.

Carbolic Acid.—When required for the above purposes, that prepared “*for Disinfecting*” should be obtained—one ounce of this added to a quart of Water is sufficiently strong to purify drains, water-closets, &c. The mixture should be vigorously stirred or shaken (as Carbolic Acid is not readily miscible with water). Half a pint of this solution put into any utensil used in the sick-room will disinfect the contents, and enable them to be preserved for the inspection of the medical man without any unpleasant effluvia arising.

Carbolic Acid-oil for anointing patients, should consist of Olive Oil and about 10 per cent. of Carbolic Acid.

Condy's fluid.—For use either with the spray producer to disinfect rooms, for cleaning sponges or bandages, washing the skin of the patient, the personal use of Nurses or Medical Attendants, dressing wounds, &c., Condy's fluid should be mixed with water in the proportion of a teaspoonful to a pint. Linen and Bed-clothes should be immersed in a solution made by mixing a wineglassful in a pailful of Water; diluted in this proportion it does not stain the linen.

CHAPTER VIII.

SPECIAL RECIPES, DIRECTIONS, AND APPLI- ANCES FOR THE SICK-ROOM.

FARINACEOUS ARTICLES—BEEF TEA—LIEBIG'S EXTRACT OF MEAT
—BRAND'S MEAT JELLY AND SOLID BEEF TEA—DARBY'S FLUID
MEAT—WHITE OF EGG—WHEY—ANIMAL FOODS RE-COOKED—
BREAD—SPECIAL RESTORATIVE—SPECIAL NUTRITIVE—COCOA
AND EGG—INVALID SOUP—COMBINATIONS OF ALIMENTARY
PRINCIPLES IN NORMAL PROPORTIONS—PORT WINE JELLY—
SUET AND MILK—MILK WITH RUM, ETC.—NUTRITIVE ENE-
MATA—NUTRITIVE MIXTURE—CEREALIN TEA—POULTICES AND
POULTICING BY STEAM—INHALATIONS—NASH'S BRONCHITIS
KETTLE—WARM BATHS—LIGHTS IN THE SICK ROOM—NURS-
ING SCHEDULE.

As this does not profess to be a "cookery book" only a few Medical-food Recipes will be here given, with some directions for the cooking* and appliances of the sick-room which cannot easily be found elsewhere.—For the ordinary kitchen recipes the reader is referred to the cookery-books of Miss Acton, and Mrs. Beeton, and to Cre-fydd's "FAMILY FARE," pp. 240 to 249.

1. FARINACEOUS ARTICLES should all be submitted to a temperature of 212° Faht. (boiling water) to make them digestible.

2. BEEF TEA should not be boiled, and should not be strained through a fine sieve or muslin. It should be made as follows. Take of Rumpsteak, free from fat and minced, 1 lb., *cold* water 1 pint, a pinch of salt. Put them

* See p. 83, On modes of cooking in common use.

into a jar and tie it down. Place the jar in a saucepan of *cold* water, raise this water slowly to boiling and keep it slowly boiling for two hours. Remove the jar and strain its contents through a *very coarse* sieve so that all finely powdered sediment may run through. Then pass a piece of bread over the surface to remove any fat that may float upon it.

3. LIEBIG'S EXTRACT OF MEAT and other similar preparations. It is important to bear in mind that *these contain very little, if any, nourishment properly so-called*; that is to say, they contain no plastic material, no fat, no saccharine matter. Their principal virtues belong to the class of stimulants and blood-tonics. When mixed with water, they are excellent menstrua in which to administer nutritive materials, such as eggs, bread, oatmeal, corn-flour, vermicelli; but without such additions they are quite incapable of supporting life for any length of time. Baron Liebig's own writings support this statement. Unless these facts are borne in mind a patient may easily be starved unintentionally.

4. BRAND'S MEAT JELLY AND BRAND'S SOLID BEEF TEA are excellent and reliable nutrients, they may be obtained at Little Stanhope Street, or through a Chemist.

• 5. DARBY'S FLUID MEAT. This is a new and valuable preparation. It contains all the constituents of lean meat, including fibrine, gelatine, and albumen; but by the process pursued these are all brought into a condition in which they are soluble in water and are not any longer coagulable on heating—in which state they have been designated *Peptones*. This change is effected, as in ordinary digestion, by means of pepsine and hydrochloric acid.

The Pepsine employed is very carefully prepared—without addition of starch or any extraneous substance. Lean

meat, finely sliced, is digested with the pepsine in water previously acidulated with hydrochloric acid at a temperature of from 96° to 100° Fah. until the whole of the fibrine of the meat has disappeared.

The liquor is then filtered—separating small portions of fat, cartilage, or other insoluble matters—and neutralized by means of carbonate of soda; and, finally, carefully evaporated to the consistence required, namely, that of a soft extract.

The resulting extract *represents in all its constituents the lean meat employed*, but with the fibrine, albumen, and gelatine changed into their respective peptones or soluble forms. This change is effected solely by the pepsine and hydrochloric acid, or artificial gastric juice, without the evolution or absorption of any gas or the formation of any secondary products.

The peptones thus formed, although agreeing exactly in chemical composition and even in many physical properties with the substances from which they are derived, differ from them by a ready solubility in water and even in diluted alcohol.

But this process, whatever care may be taken, leaves the Fluid Meat with a strong bitter taste. This bitterness attaches always to meat digested with pepsine; and this, in the opinion of medical men, would wholly preclude its acceptance and adoption as an article of food. At the same time, it curiously illustrates the identity of the process in the laboratory with digestion in the living stomach.

In order to remove this bitter taste, and to obviate the objection to Fluid Meat on that ground, Mr. Darby made many experimental researches, and at length discovered that the purpose is completely and satisfactorily effected by the addition, in a certain part of the process, of a small proportion of fresh pancreas.

The following are methods of using Fluid Meat:—

One ounce by weight, or a large table-spoonful, equals the quantity of extract, obtained by boiling, from twenty ounces of meat.

Spread between bread and butter, and sprinkled with salt, it makes an agreeable sandwich.

Dissolved in water with a little salt and pepper it forms a liquid similar in taste to beef tea.

A small dessert-spoonful of the Fluid Meat in half a pint of water, or a tea-spoonful to a large tea-cupful is a good proportion, and this may be increased as desirable.

Flavoured with suitable condiments, Fluid Meat may be taken as soup; and, compared with the amount of solid matter obtained from meat by stewing, it becomes an economical article of diet.

For Gravy Soup.—Take a little carrot, turnip, onion, and celery, with a clove, small piece of mace and pepper; boil gently, strain, and for each half pint of liquor add a table-spoonful of Fluid Meat, with a little salt.

For Vermicelli Soup.—Place in a covered jar in the oven a little sliced celery, onion, bruised spices and pepper, with water; when the celery and onion are thoroughly softened, strain, add Fluid Meat, (in the proportion of a tablespoonful to half a pint) with salt, a small knob of loaf sugar, and vermicelli previously boiled.

Another Soup.—Take two onions, a large carrot and turnip, cut into small slices, and fry them well with a little butter in a clean pan; when well browned, pour on three pints of boiling water; let stand till cold, skim, strain out the vegetables, add half a pound of girasole root previously boiled in water till soft, and two ounces of the Fluid Meat; boil for a minute or two; macaroni or vermicelli, softened by boiling, may be added at pleasure.

6. WHITE OF EGG differs from the yolk principally in containing no fat. On this account it is often better borne by bilious persons. Yolk of Egg contains 29·8 per cent. of fat; when the stomach can bear it, therefore, it is a more complete nutriment than the white. But white of Egg beaten up *in milk* answers every purpose.

Eggs for the sick should be either raw, or very lightly boiled.

7. WHEY may be made either with Warren's sweet Essence of Rennet, or with Treacle, or with sherry, according to circumstances.

- a. Rennet Whey—see the directions on the sweet Essence of Rennet bottles.
- b. Treacle Whey—pour three table-spoonfuls of best Treacle into a pint of new milk while it is boiling; see that it boils up once after the treacle is added; set it aside to cool and then strain.
- c. White Wine Whey is made in the same way as Treacle Whey, three glasses of sherry being used to a pint of milk.

Note—When a more nutritious food is desired and suitable, well beat up the curds with the whey instead of straining; see that they are not in lumps.

8. ALL ANIMAL FOODS are apt to lose digestibility by repeated cooking, (see p. 83).

9. BREAD should be either toasted or 24 hours old.

10. SPECIAL RESTORATIVE. I have found the following to be a most efficient restorative food, and the mixture is agreeable to most palates.

New milk (cold) 4 parts.

Beef tea (cold) 3 parts.

Brandy (pale) 1 part.

If no other food is taken, about 5 fluid-ounces (a quarter of a pint Imperial) should be given every 2 hours, or half

that quantity every hour. It should be sucked out of a *siphon* Infants-feeding bottle, not drunk out of a spoon or cup. When desirable this food may be gradually thickened by the addition of boiled corn-flour or other farinaceous articles, and one egg may be well beaten up in each half pint. The flavour may be varied by adding different spices.

11. SPECIAL NUTRITIVE. Beat up an egg, both white and yolk, quite smooth and free from stringy particles, stir it well into half a pint of hot milk in which enough arrowroot has been boiled to make it about as thick as cream; add a wine-glassful of sherry or a table-spoonful of pale brandy, five grains of pancreatine powder (Savory and Moore's), and some fresh nutmeg; mix all thoroughly by pouring from cup to cup. On this food alone, repeated every four hours, a patient can be well supported for a considerable time.

12. COCOA AND EGG. Beat up an egg, both white and yolk, quite smooth and free from stringy particles, stir it into half a pint of hot milk, and then add a teaspoonful of soluble cocoa, previously liquified with a little of the milk. This forms an excellent breakfast easily taken by those who cannot eat in the early part of the day.

13. INVALID SOUP. The following Invalid soup has proved extremely useful in a large number of cases, and since I first published the recipe in 1864 it has been usually kept nicely prepared by Mr. Donges, Confectioner, Gower Street, W.C.

Gravy beef 1 lb., scragg of mutton 1 lb., isinglass 2 oz., vermicelli 3 oz., mushroom ketchup 3 tablespoonfuls, corns of allspice 24, sage a sprig, cold water 3 quarts; put the isinglass and the meat cut small into the cold water, gradually boil, skim well, and then add the other ingredients; simmer four or five hours till reduced to one quart; strain through a fine hair sieve, and carefully re-

move all fat; add salt to the taste. This may be taken cold as a jelly, or warm as a soup. Calf's-foot may be used instead of isinglass when procurable; and when allowable a little *solution* of cayenne pepper should be added; and the taste may be varied by the addition of a little Worcester, or other wholesome sauce.

14. COMBINATIONS OF ALIMENTARY PRINCIPLES IN NEARLY EXACT NORMAL PROPORTIONS. (See Chapter III.)

a. Flour 4 oz., sugar $1\frac{1}{4}$ oz., suet $\frac{3}{4}$ oz., milk $\frac{3}{4}$ pint Imperial, 1 egg.—This will make a good pudding, or it may be given in any other form desired; with the addition of a little crass and salt and water it forms a complete diet, upon a sufficient quantity of which a person can live healthfully for an indefinite length of time without any other food.

b. The same may be said of the following.—Rice 3 oz., sugar 1 oz., 2 eggs, butter $\frac{1}{2}$ oz., milk $\frac{3}{4}$ pint (Imperial), water as much as is sufficient to boil the rice in.

c. Suet $\frac{1}{4}$ lb., flour 1 lb., water 13 oz. These quantities when boiled yield 2 lbs. of pudding.

15. PORT WINE JELLY. Take of port wine 1 pint, isinglass 1 oz., sugar 1 oz.; put the isinglass and sugar into $\frac{1}{4}$ pint of water, warm till all is dissolved, then add the wine, strain through muslin and set to jelly. (An excellent way of giving port wine.)

Another form, firm enough to carry in the pocket cut up in cubes, may be made as follows:

Take isinglass and gum Arabic of each an ounce, dissolve in a pint of port wine over a slow fire; sweeten with fine sugar to the taste, and after straining through a fine sieve, grate in a small nutmeg. Take about a cubic inch when feeling weak or low.

16. SUET AND MILK. Put a table-spoonful of shredded beef suet into $\frac{1}{2}$ a pint of fresh milk, warm it sufficiently

to completely melt the suet, then skim it, pour it into a *warm* glass or cup, and drink it before it cools. If there is any difficulty in digesting the suet add 5 gr. of Pancreatine powder. (Savory and Moore's).

17. MILK WITH RUM, BRANDY, OR WHISKEY. Put one tablespoonful of Rum, Brandy, or Whiskey into half a pint of new milk, and mix well by pouring several times from one vessel to another. "Bilious" persons should heat the rum before adding it to the milk.

18. NUTRITIVE ENEMATA. When nutriment is given in enemata the quantity should not exceed from 2 to 4 oz., and the temperature should be about 80°.

The bowel should be first washed out with half a pint of warm water.—An elastic bottle holding the required quantity is better for nutritive enemata than the ordinary enema syringe. They should be given while the patient is lying on the back with the hips raised on a pillow.

The following constitutes a most important means of preserving life when food cannot be given by the stomach.

Take of cooked beef or mutton finely grated $\frac{1}{4}$ lb.

Pancreatic Emulsion (Savory and Moore's) 1 oz.

Pancreatine powder (Savory and Moore's) 20 grains.

Pepsine (Porci) 20 grains.

Mix the whole in a warm mortar quickly and add Brandy one table-spoonful and enough warm water to bring the mixture to the consistence of Treacle. Inject from an elastic Enema bottle, as quickly after the mixture is made as possible, and let it be retained. (See Appendix VII.)

19. NUTRITIVE MIXTURE. When a patient will take medicine but not food.

Liebig's Extract of Meat a tea-spoonful.

Lœflund's Liebig's Extract of Malt a tea-spoonful.

Tincture of Capsicum one drop.

Compound spirit of Horseradish a tea-spoonful.

Water 2 table-spoonfuls. Mix well in a mortar.

To be given every 3 or 4 hours. This will often bring back the desire for food.

20. CEREALIN TEA. Cerealin is contained in the white matter adhering to the inner side of the best fresh bran, its digestive power is suspended by a temperature above 170° Faht. The tea therefore should be made by infusing fresh bran (taking care to select that which has plenty of the cerealin upon it) in hot water of a temperature below 170°. It may be drunk freely at meals with great advantage where the power of digesting gluten is defective. But should not be taken by those, *with over acid stomachs*.

21. POULTICES. Linseed poultices should be made by filling a muslin bag with crushed linseed, (not linseed meal) then putting it into a basin or dish and pouring boiling water upon it.—When thoroughly soaked it should be squeezed between towels till no water drips from it. The same poultice may be made hot four or five times by pouring fresh boiling water upon it. Bread poultices should be made of finely crumbled bread treated in the same way as the linseed.

POULTICING BY STEAM. A NEW MEANS OF APPLYING EITHER MOIST OR DRY HEAT TO THE SURFACE OF THE BODY. AT a Meeting of the Abernethian Society of St. Bartholomew's Hospital, February 10th, 1853, I introduced the use of vulcanized rubber bags, filled with *hot water*, as a "new means of applying heat, and of maintaining the temperature of warm applications," and the suggestion has been followed to a considerable extent in the use of hot-water bags, as foot-warmers, stomach-warmers, and the like; but the difficulty of preventing the water from accumulating in one part of the bag by gravitation, and (when this is prevented by septa and by completely filling the bag) the *great weight* of the water, have presented hitherto insuperable objections to the general use of large

hot-water poultices, which in all other respects offer so many advantages. When the part to be poulticed can be placed *upon* the hot water bag, it answers perfectly.

In the treatment of Bronchitis, Pneumonia, Peritonitis, Phlebitis, and all other inflammatory affections *occupying large areas*, when it is desired to employ equable warmth for protracted periods, the difficulty of doing so in a satisfactory manner is only too familiar to all practical physicians and surgeons.

This difficulty I have now removed by an important modification of my original design, viz., *the employment of Steam instead of Water*, thereby getting rid of all the objections which prevented the complete success of my suggestion in 1853.

Messrs. Maw, Son, and Thompson are prepared to supply the apparatus for Poulticing by Steam,* with either dry or moist heat—adapted to any part of the body—at a moderate cost.

22. FLUIDS FOR INHALATIONS should have a temperature of about 170° Faht.

23. "NASH'S BRONCHITIS KETTLE" sold at 253 Oxford Street, is a convenient appliance for impregnating the air of a room with warm moisture either pure or medicated. Full directions for use are supplied with the kettle.

24. WARM BATHS should not exceed a temperature of 98° without medical orders.

25. THE LIGHTS IN A SICK-ROOM should always be placed behind the patient, not in front. Gas should not be used at all. (See "Ventilation"). Candles are better than lamps.

26. A NURSING SCHEDULE should be used in all Fevers, Inflammations, Surgical Cases, and other Acute Illnesses.

* This apparatus was exhibited at the meeting of the British Medical Association, in Norwich, August, 1874.

Those who have been called upon to bear the responsibility of the Nursing in a severe case of Fever, Inflammation, Surgical Operation, or the like, will have a vivid recollection of the difficulties they encountered in carrying out the various Medical Orders upon the punctual attendance to which, through anxious days and nights, the patient's life depended.

How to arrange the hours for Nutriment, for Medicine, for Wine, for Brandy, for dressing wounds, for external applications, for Sleep, &c., &c., without one important item clashing with another, is often a most puzzling question, requiring the details to be carefully considered and arranged *in writing*, before it is practicable to work them out.

Not unfrequently the orders left by the doctor are misunderstood, or found to be impracticable when they come to be put together and arranged according to time—the hours for dressing wounds or taking Medicine clashing with those for Food, the hours for Wine coming upon those for Brandy, or interfering with the necessary sleep, and so forth. When the doctor has gone and, perhaps, as in country houses, cannot possibly be consulted again for many hours, it is difficult to overstate the distress of friends and nurses on discovering that orders, which have been impressed upon them with all the weight of questions of life and death, cannot be implicitly carried out from want of a consistent arrangement of their details.

Happily for the sick, and for the doctors, nursing is now passing into the hands of educated Ladies and well trained Nurses, competent to understand and to perform with intelligence that systematic nursing to which the enlightened practical Medicine of the present day attaches such vital importance. And the introduction of the Clinical Thermometer and similar appliances into the

sick room, makes it necessary in private houses (where there are no clinical assistants or house-surgeons as in hospitals) to entrust the nurse with the task of keeping a register of the temperature, the rate of pulse and respiration, &c., at hours when the doctor cannot be in attendance.

The doctor who believes in the importance of his own orders will be strict in requiring at each visit an accurate report of how they have been obeyed. The nurse who intends to obey them faithfully will not be satisfied unless she sees that they are both intelligible and practicable before the doctor leaves the house, and *she should write them down* directly he is gone.

PART II.

ON THE INTERDEPENDENCE AND PREVENTION OF DISEASES AND THE DIMINUTION OF THEIR FATALITY.

“Amid all the dangers that threaten this Metropolis there is a sad certainty more serious than any one of them.....it is not disease but it is not health. It is a low state of vitality, of physical power, of mental energy, of enjoyment, and even of moral strength.”—“THE TIMES,” August 4th, 1853.

PART II.

ON THE INTERDEPENDENCE AND PREVENTION OF DISEASES AND THE DIMINUTION OF THEIR FATALITY.*

CHAPTER IX.

THE DUTIES OF MEDICAL MEN—THE INTERDEPENDENCE OF DISEASES SHEWING THE IMPORTANCE OF PERIODICAL EXAMINATIONS.

GENTLEMEN, we are all members of a *practical* profession. We have taken upon ourselves high and responsible duties, all culminating in action. So long as we choose to assume these duties in a profession, as yet so far from perfection, we are not justified in spending our time in scientific investigations or speculations, unless they have for their end some practical application for the good of humanity. It is the hope of attaining such an end which has led me on in the design and labour of these Lectures.

I proceed at once to lay it before you.

In the beginning of the first Lecture I asserted, that we are justified in practising the profession of medicine only in proportion as we believe in the articles of the following creed:—

1. That man may be the instrument through whom the

* Selections from LECTURES "On the Germs and Vestiges of Disease and on the Prevention of the Invasion and Fatality of Disease," delivered by THE AUTHOR to medical practitioners and students at the Royal Hospital for Diseases of the Chest, in 1861.

invasion and progress of premature destructive changes in the human organism may be prevented or arrested.

2. That man may be the instrument through whom the damaged organism may be more efficiently repaired.

3. That man may be the instrument through whom the sufferings of the human being may be alleviated.

In what sense the organism is capable of accomplishing these ends *without* the instrumentality of man, I have shown you (in the previous lectures) by numerous arguments and examples. I have also shown you the various modes *by which it becomes deprived of this capability*. The conclusion at which I now arrive is this, that man may be the instrument through whom *the capability of accomplishing these ends may be preserved and restored to the organism*.

The manner in which man is to exercise this instrumentality is the next point for our consideration. But I think we have almost reduced it to a necessary conclusion. For as we have plainly seen that the organism is competent to take care of itself, provided that it possesses a normal Vital force and is surrounded by normal conditions of life; and as we have also seen that the great causes of defect in the force are *the vestiges of disease and abnormal conditions of life*; and as we have also learnt that the diseases, from which the vestiges result, are *invited* by defects of the force; and that, when thus invited and received into the organism, they are capable of being disposed of without leaving vestiges behind, if the Vital force is free from excessive defect; that thus these vestiges are due to defective force; and as we have learnt that the earliest invasion of defects in the force—upon which all the long and intricate succession of ills depend as a germ—as we have learnt, I say, that this state of germination exists at a period anterior to the manifesta-

tion of disease in its ordinary characters, and that it is to be found in the garb of slight impairments of the general health, the indications of which are more and more evasive and occult, the earlier the *stage of germination*; and, finally, as we have learnt that it is in this occult and evasive stage of germination that the defect is most easily and most efficiently to be remedied; I think you will agree with me in the practical conclusion at which I have arrived.

This conclusion is—that the manner in which man is to exercise his instrumentality for the prevention of disease, the prevention of the vestiges of disease, and the prevention of fatality in disease, is to search out these earliest evasive periods, of defect in the physiological state, and to adopt measures for their remedy. (See p. 206 “ABNORMAL PHYSIOLOGICAL STATES”).

This appears to me to be the highest, the most ennobled duty of the physician, calling for the most abstruse knowledge of the science of life, the deepest experience in disease, the keenest exercise of the perceptive faculties, the calmest, most far-sighted reasoning and the wisest judgment,—a duty as much above the management of *acute disease* as to rule an empire is above fighting a pitched battle.

Now, I am perfectly convinced, from my own observation and experience in practice, that patients never think of consulting their doctors till these conditions of impaired general health have advanced far enough to have been developed into some form of disease: that thousands and thousands of persons, believing themselves to be in health, are nevertheless undergoing these early, occult, and evasive stages of defect in the physiological state; and that such persons may be considered to be in health, not only

by themselves, but by any one accustomed to associate with them.

The only means by which to reach this evil and to obtain the good, would be *for persons to submit themselves and their children to systematic periodical examinations.*

Such examinations ought to include an inquiry into the family history, to learn the hereditary constitution; into the personal history, to learn all the previous diseases that have been passed through, and the habits and vicissitudes of life; into all the conditions of life surrounding the individual; into the condition of the organs and functions of the body; into the state of the secretions and fluids of the body by analyses and microscopical examinations; and so forth.

The examination should be reported in writing; and, after due consideration, such advice should be given as a careful judgment may dictate, for the future conduct, pursuits, and habits of the patient, with a view to correcting any defects or tendency to defects in the organism. Advice should also be given as to the means of removing any vestiges of disease that have been detected, or if they are not removable, advice as to the best way of overcoming their influence or of averting their increase. To this must be added precautions to be adopted in certain contingencies which, according to the judgment of the case, appear probable.

If such a plan as I have here proposed were to be faithfully and conscientiously carried out by the present and rising generation of well-educated, studious, medical men, immense benefit would be conferred *upon the public*. The next question is, then, what would be the effect *upon the profession* in a pecuniary and in an ethical sense. With regard to the pecuniary question, it is only necessary to

observe that, of course, I do not expect that any man in good practice, whose time is profitably employed, could conduct such an examination and give such advice for the usual consultation-fee. A special fee would be necessary to enable him to give the necessary time and consideration to every case.

But this should in no way interfere with the power of the *poor* to participate in such a system. Every hospital and dispensary should institute a distinct department for the conduct of such examinations, and for giving the necessary advice. Every patient discharged from its wards should be submitted to this department before returning to the duties of life.*

I have again and again referred in these Lectures to the numberless anomalous symptoms, the pains, discomforts, nervous disturbances, etc., etc., which affect persons in abnormal physiological states, and which increase in their severity, obviousness, and number, as the states of health become more and more degraded, and the occurrence of some acute disease becomes more imminent. I have pointed out to you that these are the states of health which fill our consulting-rooms and the out-patient departments of hospitals and dispensaries.

In further confirmation of my statements on this point I may remind you of some apposite observations by Sir Henry Holland on the subject of symptomatic complaints. In his "*Medical Notes and Reflections*" he says, speaking of gouty blood.—"Irregular actions of the *heart*, *hypochondriacal depression*, as well as the more common symptoms of *dyspepsia* and *disordered secretions*, frequently antecede by months the first appearance of gout in the extremities,

* For details of the mode of carrying out the Examinations at public Charities, see a paper by the Author read at the Guildhall, June, 1862. "*Transactions of the National Association for the promotion of Social Science.*"

and occasionally give serious alarm even to those who look with medical eyes upon these ambiguous cases.”—(p. 246, 3rd edition).

“Modern observation has led us to recognize some of these relations (of gout with local or constitutional disorders) under the names of *gouty headache*, *gouty ophthalmia*, and *gouty bronchitis*. My own experience would lead me to add many cases of *asthma* to the number. I have so often seen this disorder prevalent in gouty families, affecting those who do not undergo the disease in the joints, and ceasing wholly or in part when the gout appears externally, that I cannot doubt the existence of this relation.

“The greater tendency to *apoplexy* in this habit is noticed by many of the older writers, and confirmed by general experience.

“Reference has already been made to *hypochondriasis* and *hysteria*; and it is probable that other disorders of the same class, *still less generally viewed under this connection*, will hereafter be submitted to it.

“The relation of gout to the functions and disorders of *the liver* is another point of much interest in pathology, clearly attested both in the active symptoms of the disease and by those which are common under other forms of the gouty temperament. This, moreover, is one of the points associating it with that group of maladies bearing the vague name of *dyspepsia*.

“The connection of gout with *cutaneous affections* is an additional topic, yet almost unexamined; though I cannot doubt, from my own observation, that certain of these disorders occur as effects of the habit in question.”—(*Op. cit.*, pp. 253-54).

That enormous quantities of medicine are dispensed in the out-patient departments of hospitals and dispensaries

for the *temporary relief* of this class of functional derangements and local diseases—for complaints which might be prevented by the patients themselves if they were properly informed of the causes and premonitory symptoms of their maladies—is a fact which must be perfectly familiar to all my hearers. Such a system of examination and advice as I propose, if properly carried out, must strike at the root of these evils, and would at the same time reduce the miserable over-crowding of the hospital waiting-rooms, and the enormous expenses incurred for drugs. These are considerations which, however important as elements of social and political economy, are elevated far above the rank of financial questions by the fact I have endeavoured to demonstrate in these Lectures, that *by these same means, and at the same time, we shall so largely promote the economy of life.*

I hope, Gentlemen, that you will draw the attention of the treasurers and governors of any hospitals, to which you may belong, to this subject. It is necessary to the credit and honour of our profession, that improvements in these medical establishments should not come from the public to us, but *should originate among ourselves*, and be urged by medical men upon the public attention.

The following sketch of a common complaint, and a common story, may illustrate the need for some such system as I propose. A lad of fifteen is admitted into a hospital ward with a first attack of rheumatic fever. He is treated with skill, and nursed with care, and in two or three weeks he is convalescent, and returns to his home without having received any damage to his heart or other organs. But he has no proper understanding of the nature of his complaint, of the conditions of life calculated to keep up the morbid influence in his organism; no clear notions of the diet which he ought or ought not to adopt;

no knowledge of the premonitory symptoms by which a fresh attack of rheumatic fever is heralded, or of the precautions necessary when such an attack is feared. He has probably a general idea that his great enemy is cold, and his great friend flannel; and that is as likely to lead him wrong as right in the measures he adopts.

He goes back to his home and his pursuits apparently well. He keeps his skin closely cased in flannel, and his dwelling-rooms warm, but he neglects altogether to provide for efficient excretion by the skin. He chooses a business, either utterly regardless of its fitness for his constitution, or makes as great a mistake by selecting one in which he may be sure of warm—that is to say close—rooms and workshops, by which he is deprived of exercise and oxygen. He drinks beer, eats cheese, and so forth, like other people in his position. After a few months *he comes back as an out-patient* at the hospital, with severe acid dyspepsia; and after consuming the usual amount of drugs for several weeks, gets relief, and goes back to his old habits. A few months more, and he appears again, the subject of a skin disease; goes again through the consumption of drugs, and gets well and goes back to work. By-and-bye he comes again with diarrhoea, and goes through the same process; at another time with gravel, and gets relief again. At length, a few years perhaps having elapsed and after some months of depressed health, with palpitations of the heart, gloomy thoughts, irritable temper, and general *malaise*, he happens to be out on a damp raw day, gets a chill, and applies again at the hospital, with a *fresh attack of rheumatic fever*. This time he suffers from endocarditis, and after some weeks returns again to his home, “discharged cured,” but with disease of the valves of his heart. He has been thoroughly well treated, and is very free from rheumatic poison, and hence

goes on for a considerable time without much inconvenience; but having no clear ideas of the *nature of the damage he has received*, or of the precautions necessary to prevent its increase or the production of secondary diseases dependent upon this damage for their cause, he gradually becomes the subject of congested lungs and liver; of attacks of bronchitis to which he was not formerly inclined; his breathing becomes short, his old dyspeptic troubles, cutaneous affections and gravel, recur again and again, and his capability of following his former occupations gets less and less.

If he does not have another attack of rheumatic fever, he comes back to the hospital some future day with chronic bronchitis, or with apoplectic symptoms, or with congested liver, or still later with albuminuria and dropsy. At length he dies, and *his death is registered* under the head of apoplexy, heart-disease, or dropsy. (See "Tables shewing the Interdependence of Diseases," pp. 177-184).

All medical men of experience will admit that this sketch is no exaggeration; that I have, in fact, omitted numerous details of minor diseases and discomforts, that are sure to have existed in the case itself. I have said nothing of the effects upon this man's children of his continued ill-health, or of the poverty and want of food brought upon his wife and family by the same cause, and *acting as fresh causes of disease in them*. But I have said enough to make it quite clear, that, in the course of a life prematurely ended, he must have consumed a vast amount of money in the form of drugs, and a vast amount of nervous energy, if not of brains, in the form of medical advice.

It is to the first causes, to the "wells and springs" of such a series of calamities as this, that I have directed your attention as fellow medical practitioners and stu-

dents, and to which I now beg that you will direct the attention of the Treasurers and Governors of Hospitals and Dispensaries, of your private patients, and of the public at large.

* * * *

In my fourth lecture I gave an Etiological analysis of those states of disease assembled under the following six headings in the Registrar-General's Reports of the deaths in London. (Report of the deaths in London registered in the 21st week of each of the ten years 1848-57. The Report current at the time the notes for these Lectures were made.)

1. Typhus, typhoid and other forms of continued fever.
2. Apoplexy and Paralysis.
3. Heart diseases and Pericarditis.
4. Rheumatism and Gout.
5. Bronchitis.
6. Atrophy and Debility.

I demonstrated that, when we analyse the natural history of any disease, we find that the *principal factors of its essential cause, of its predisposing causes and of the causes of its fatality* fall under one of the three headings:—1. Conditions of life. 2. Coetaneous diseases. 3. Vestiges of Disease.

I showed not only theoretically but from actual observations made by others as well as by myself, how the organism becomes damaged by these VESTIGES OF DISEASE—how the vital force becomes defective through these Vestiges, how this defective state of the vital force becomes the essential cause and the predisposing cause of disease; and how the Vestiges of one disease become the causes of fatality in whole families of other diseases.

I endeavoured to prove, by an array of facts, that the vestiges of disease become causes of fatality in other diseases principally in two ways.

1. By destroying those modes of matter and that correlation of conditions upon which the existence of the vital force in its normal condition depends, thus producing *excessive defect of the vital force*.

2. By producing excessive defect in the condition of some part of the organism, occupying the position, at the time, of an essential *instrument* in the processes of life, and thus causing the organism to break down at this its weakest part.

I pointed out that in the large majority of deaths from disease, *the fatality is due, not to the disease itself, but to the vestiges of some pre-existent disease, operating in one or other of the above ways.*

In illustration of this great fact, I have set forth the course of events, by which the vestiges of disease, passing under the names of ANÆMIA and FATTY DEGENERATION, become the actual causes of a large number of the deaths registered under the following names:—

Tabes mesenterica, croup, measles, hydrocephalus, whooping-cough, dentition, convulsions, apoplexy, paralysis, delirium tremens, intemperance, angina pectoris, diseases of the heart, pneumonia, diarrhoea, mortification, influenza, peritonitis, childbirth, bronchitis, jaundice, liver disease, kidney disease, and some others.

As an indication of the *insidious way* in which the deadly influence is exerted by these states—ANÆMIA and FATTY DEGENERATION—(which are only examples of a class), I called attention to the fact that *their names do not appear* in the bills of mortality. (See Anæmia, and Fatty Degeneration).

My present object is to exhibit in a conspicuous manner the INTERDEPENDENCE OF DISEASES. (See "Preliminary Remarks," p. 1). I have, therefore, restricted myself to a statement of the influence exerted by the vestiges of

each of the diseases analysed in the preceding Lectures upon the rest of the same little group, and in order that the different relationships may be seen at a glance I have arranged the facts in a tabular form.

In the following tables the first column gives a list of the vestiges of the disease at its head. The second column shows to which of the diseases already analysed each vestige may become the predisposing cause; the third column shows to which of these it may become the essential cause; and the fourth column shows to which it may become the cause of fatality—the heading under which it will take its place in the Registrar's Reports. It must be remembered that several vestiges usually concur in producing their effects.*

* The Table shewing the Interdependence of Winter Cough with other Diseases, p. 184, has been since added and is somewhat differently arranged.

TABLES SHEWING THE INTERDEPENDENCE OF DISEASES REGISTERED UNDER THE FOLLOWING NAMES:—
RHEUMATISM AND GOUT—CONTINUED FEVER—APOPLEXY AND PARALYSIS—HEART DISEASE AND
PERICARDITIS—BRONCHITIS—ATROPHY AND DEBILITY.

I. VESTIGES OF ONE OR MORE AT- TACKS OF RHEUMATIC FEVER—		BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Valvular disease.	Bronchitis.	Apoplexy. Mechanical heart disease.
Pericardial effusion. Pericardial ad- hesions to the heart or pleura.
Pleuritic adhesions and effusions.
Stiffened joints.	Atrophy and debility. Degener- ative heart disease.	Local paralysis.
Tendency to a repetition of the at- tack, and of its determination to the damaged parts.	A repetition of an attack of gout or rheumatic fever. ...	...
Anæmia.	Typhus; heart diseases, (de- generative and mechanical).	Atrophy and debility in the subject, and in the offspring if the subject is a female. ...
Debility and nervous exhaustion, especially from repeated attacks.	Bronchitis. Rheumatic and gouty attacks. Typhus. ...	Paralysis. Bronchitis. Typhus. Heart disease. Rheumatism and gout. Heart disease. Atrophy and de- bility.

II. VESTIGES OF ONE OR MORE ATTACKS OF GOUT—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Deposits of urate of soda in and about joints and some other parts.	Apoplexy....	Heart disease.	... ..
Tendency to a return of the attack in the parts previously affected. ...	Attacks of gout.	... ..	... ..
Anæmia and nervous exhaustion especially from repeated attacks. ...	Bronchitis. Rheumatic and gouty attacks. Typhus.	Apoplexy and debility. Atrophy and debility in the offspring if the subject is a female. ...	Bronchitis, Rheumatism and gout. Typhus. Heart disease. Atrophy and debility. ...
III. VESTIGES OF RHEUMATISM OR GOUT, WHEN THE ESSENTIAL CAUSE HAS REMAINED LONG IN THE ORGANISM WITHOUT PRODUCING ACUTE GOUTY OR RHEUMATIC INFLAMMATION—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Fatty and calcareous degenerations or deposits in the heart, arteries and capillaries. Degeneration of the tissues generally... ..	Apoplexy and paralysis. Bronchitis.	Apoplexy and paralysis. Heart disease (mechanical and degenerative). Atrophy and debility... ..	Rheumatism and gout. Apoplexy and paralysis. Bronchitis and typhus. ...
Chronic disease of the kidneys. ...	Bronchitis.	Apoplexy (uræmic). Heart disease... ..	Paralysis. Apoplexy. Rheumatism and gout. ...
Stiffened and contracted joints. ...	Degenerative heart disease.	... ..	... ..
Cutaneous affections.	Attacks of gouty or rheumatic inflammations, when the skin disease is suppressed. ,	... ..	... ..
Anæmia and other forms of debility.	Degenerative and mechanical heart disease. Bronchitis. Rheumatic and gouty attacks. Typhus.	Apoplexy and debility in the subject. Atrophy and debility in the offspring if the subject is a female. Dilatation and degenerative hypertrophy of the heart. ...	Paralysis. Bronchitis. Rheumatism and gout. Typhus. Heart disease. Atrophy and debility. ...

IV. VESTIGES OF RHEUMATISM OR GOUT ACTIVE OR LATENT—	BECOME PREDISPOSING CAUSES OF	ESSENTIAL CAUSES OF	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
The rheumatic or gouty constitution transmitted to a future generation.	Rheumatism, gout, and heart disease in the generation concerned.	Rheumatism, gout, heart disease and debility in the generation concerned.	... ..
V. VESTIGES OF TYPHUS, TYPHOID, AND OTHER FORMS OF CONTINUED FEVER—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Tendency to fatty degeneration. ...	Debility. Degenerative heart disease.... ...	Degenerative heart disease, in cases of pre-existent hypertrophy.	Paralysis.... ...
Great defect in the vital force especially during protracted convalescence.	Bronchitis. Attacks of rheumatic or gouty inflammation. Acute specific diseases. ...	Atrophy and debility. Heart disease.... ...	Bronchitis. Atrophy and debility. Rheumatism and gout. Heart disease. Paralysis.
Increased irritability in the nervous system.	Heart disease and apoplexy, in those previously affected by other Predisposing Causes.	... ..	... ..
Softening of parenchymatous organs and of the tissues generally. ...	... ..	... ..	(When affecting the brain), apoplexy.
Tendency to extravasations of blood.	Apoplexy and paralysis. ...	... ..	Heart disease. Apoplexy. Bronchitis.
Typhoid deposits, and enlarged mesenteric glands, spleen, etc. ...	... ..	Atrophy and debility. ...	Any other form of continued fever.

VI. VESTIGES OF APOPLEXY—

	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Paralysis of sensibility or motion. ...	... ..	Atrophy and debility, by pro- ducing fatty degeneration. ...	Bronchitis. Heart disease. Apo- plexy.
Strong tendency to a recurrence of apoplexy in a more severe form. ...	Apoplexy and paralysis.	... ..	... ..
Softening of some part of the brain...	Apoplexy...	Paralysis.	Typhus. Apoplexy.

VII. VESTIGES OF PARALYSIS—

	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Tendency to recurrence of the at- tack in a more severe form, or to apoplexy.	Paralysis. Apoplexy. ...	... ..	... ..
Tendency to mortification in the paralysed parts.	Atrophy and debility. Typhus. ...
Softening of a portion of brain or spinal cord.	Apoplexy. Typhus.
Diseases of the urinary tract...	Apoplexy. Paralysis. Heart dis- ease.
Degeneration of the paralysed parts or of the organism generally.	Heart disease, (degenerative).	... ..
Tendency to death in attacks of acute or chronic disease.	Typhus. Atrophy and debility. Bron- chitis. Rheumatism and gout.

VIII. VESTIGES OF DISEASES OF THE HEART AND PERICARDIUM—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Constriction or insufficiency of the valves. Adhesions of the pericar- dium.	Bronchitis. Apoplexy and Paralysis (by inclining to fibrinous clots in the circu- lation).	Dilatation and hypertrophy of the heart.	Bronchitis. Rheumatic fever.
Tendency to degeneration after re- peated inflammations.	Fatty degeneration of the heart.	... ..	... ..
Hypertrophy of the heart.	Fatty degeneration of the heart	... ..	Bronchitis. Rheumatic fever.
Venous congestion of the lungs, brain, liver, and all parts in arrear of the obstruction in the heart. ...	Bronchitis. Apoplexy... ..	Apoplexy and paralysis. ...	Bronchitis. Heart disease. Rheu- matic fever. Typhus.
Tendency to inflammation, hæ- morrhages, and fluxes in the or- gans congested.	Bronchitis. Toxic heart dis- ease. ... ..	... ..	Rheumatic fever. Typhus.
Obstruction to the systemic arterial circulation, secondary to the ven- ous congestion.	Bronchitis.	Aggravated hypertrophy and dilatation of the heart. Apo- plexy and paralysis.	Apoplexy. Bronchitis. Heart dis- ease. Rheumatism and gout. Ty- phus.
Dilatation of the heart and defect in the force of the systemic circulation.	... ..	Atrophy and debility.	Heart disease. Typhus.
Tendency to death from any subse- quent disease, surgical operation, or accident.	Debility. ... ..	... ..	All forms of heart disease. Rheu- matism and gout. Bronchitis. Apoplexy and paralysis. Typhus.
Angina pectoris.... ..	... ..	... ..	Bronchitis. Heart disease.
Diseases of the kidneys, from con- tinued congestion. Dropsy.	Apoplexy.... ..	Apoplexy.... ..	Heart disease. Bronchitis. Atrophy and debility. Typhus.

IX. VESTIGES OF BRONCHITIS—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Dilated bronchi...	Bronchitis.	... ..	Bronchitis.
Emphysema.	Bronchitis. Heart disease. ...	Heart disease.	Bronchitis. Atrophy and debility. Heart disease.
Hypertrophy of the heart, especially dilatation.	Bronchitis. ... ..	... ..	Bronchitis. Apoplexy.
Chronic bronchitis, (with or without bronchorrhœa).	Apoplexy...	Heart disease. Atrophy and debility... ..	Heart disease. Rheumatic fever. Atrophy and debility. Bronchitis, by exhaustion from excessive dis- charge, or asphyxia from accumu- lation of secretion.
Hepatic venous congestion (Kier- nan).	Bronchitis. ... ..	... ..	... ..
General venous congestion and de- ficiently oxygenated blood... ..	Apoplexy...	... ..	Typhus. Apoplexy. Subsequent attacks of bronchitis.
Thickened bronchial walls. ... ..	... ..	... ..	Bronchitis.
Debility.	Typhus. Rheumatism. Heart disease... ..	Atrophy and debility.	Bronchitis. Paralysis. Any severe disease, especially typhus and others due to a morbid poison in the blood.
Kidney disease, secondary to other vestiges... ..	Apoplexy. Rheumatism.	Apoplexy. Heart disease.	Heart disease. Rheumatism and gout. Typhus. Apoplexy.

X. VESTIGES OF ATROPHY AND DEBILITY—	BECOME PREDISPOSING CAUSES OF—	ESSENTIAL CAUSES OF—	AND CAUSES OF FATALITY IN— (Headings under which the death is Registered).
Rickets, in children produced while the mother is suffering from atrophy and debility.	Typhus and acute specific diseases generally.	Atrophy and debility.	Bronchitis. Typhus.
Scrofulosis or tuberculosis, in the children produced while either parent is suffering from atrophy or debility.	Paralysis (from strumous diseases of vertebæ).	Atrophy and debility.	Bronchitis. Typhus.
Degeneration of tissues generally, or of those of some organ or part.	Apoplexy and paralysis, heart disease.	Debility. Heart disease. Apoplexy and paralysis.	Apoplexy and paralysis.
Dilatation of the heart, especially in those who have made frequent ascents during atrophy and debility.	Bronchitis.	Atrophy and debility from deficient circulation.	Bronchitis. Typhus. Rheumatism. Apoplexy and paralysis. Heart disease.
Fibrinous clots in the heart or vessels, which may float off.	Apoplexy or paralysis.	Apoplexy and paralysis (if clots float into the cerebral or spinal vessels).	Apoplexy. Heart disease. Rheumatism. Typhus. Atrophy and debility.
Lardaceous or albuminoid deposits especially in the liver, spleen, lymphatic glands, and kidneys.	Atrophy and debility.	Atrophy and debility.	Typhus.
Deformities in the osseous skeleton.	Atrophy and debility. Local paralysis. . . . .	. . . . .	Bronchitis. Heart disease.
Arrest of development in certain muscles or other parts of the organism. . . . .	. . . . .	Atrophy and debility. Local paralysis. . . . .	. . . . .
Effusions into serous cavities, and discharges from the mucous passages. . . . .	. . . . .	Atrophy and debility.	Bronchitis. Heart disease. Typhus. Rheumatism and gout.
Tendency to become affected by any morbid influence to which the organism may be exposed (general predisposition to disease).	Typhus. Bronchitis. Heart disease. Rheumatism and gout. . . . .	. . . . .	. . . . .
Tendency to death from all acute and chronic diseases, occurring during the continuance of atrophy or debility. . . . .	. . . . .	. . . . .	Apoplexy and paralysis. Bronchitis. Heart disease. Typhus. Rheumatism and gout. Atrophy and debility.

TABLE SHEWING THE INTERDEPENDENCE OF WINTER COUGH WITH OTHER DISEASES.*

DISEASES WHICH ACT AS CAUSES OF NASO-PULMONARY CATARRH.	DISEASES CAUSED BY NASO-PULMONARY CATARRH.	DISEASES AND CONDITIONS THE FATALITY OF WHICH IS INCREASED BY WINTER COUGH.	EFFECTS OF WINTER COUGH UPON SUCCEEDING GENERATIONS.
Rheumatism { hereditary or acquired.	Bronchitis.	Typhus, Typhoid, Rheumatic, and other Fevers; Measles, Small-pox, Whooping-cough, and other acute diseases. Pregnancy, Parturition, Lactation. Hernia. Cerebral Diseases. Heart Diseases. All Internal Congestions.	Hereditary pre-disposition to Catarrh, Bronchitis, Emphysema, Asthma. Consumption, Scrofula, and other forms of Constitutional Debility, due to the deteriorated health of Parents.
Gout . . . { hereditary or acquired.	Thickening of the walls of the air passages.		
Syphilis { hereditary or acquired.	Bronchiectasis.		
Scrofula . . { hereditary or acquired	Emphysema.		
Winter Cough, { hereditary, } in	Heart Diseases.		
(Catarrh, Bronchitis, Emphysema, Asthma)	Cerebral Diseases.		
Rickets.	Stomach Affections (Dyspepsia).		
Measles.	Liver Diseases.		
Influenza.	Kidney Diseases.		
Whooping Cough.	Dropsy.		
Heart Disease.	To these may be added—Hernia, which is frequently a consequence of violent coughing. Disintegration of Lung Tissue, or Catarrhal Consumption. Tubercular Consumption.		

* See the Author's work "On Winter Cough, Catarrh, Bronchitis, Emphysema, and Asthma," 3rd edition. Churchill, 1875.

Having shown the remarkable interdependence which exists between different diseases—how they act and react upon one another, I must attempt, in this Lecture, to show *to what extent one vestige of disease, or the several vestiges of one disease, may act as essential causes and as causes of death in other diseases.* I will first take some Diseases which have no place in the Registrar's report. This will enable us to observe how many of the headings under which deaths are registered in that report owe their existence there to diseases which *never figure at all as causes of death.*

The first example I have chosen is *Anæmia*, a name that does not appear in the Registrar's Reports.

CHAPTER X.

ANÆMIA.

A careful examination of the subject teaches us that Anæmia is one of the most frequent vestiges of all severe diseases when they do not terminate in death;—the patient remains anæmic during convalescence, and in a large number of cases continues so long after returning to the duties of life. Again, we observe that anæmia is continually occurring in connection with the periods of puberty and the cessation of the catamenia, and that, during the intervening years, it is one of the most frequent forms of impaired health connected with derangements of menstruation, with lactation, with convalescence from the puerperal state, and during pregnancy.

Innumerable other causes may be found for this condition, which is, in fact, the type of most of those miserable states of health referred to by *the Times* in the memorable article already quoted—"There is a certainty worse than any occasional and precarious plague. We may anticipate it from our own experience—we may see the great fact with our own eyes. It is not disease, but it is not health. It is a low state of vitality, of physical power, of mental energy, of enjoyment, and even of moral strength. Shocking as it may seem, a plague once in twenty years seems but a light evil to so low a condition of humanity."

From a concatenation of circumstances, it so happens that the female portion of the population have to support the principal weight of this dire affliction. Anæmiated girls, anæmiated brides, anæmiated spinsters, anæmiated

mothers, abound in the consulting room, the out-patient room, the hospital ward, the home; wherever, in fact the physician's duties call him there they are to be found. Yet from the long list of diseases named in the mortality tables, this name, anæmia, is absent. Is it, then, a thing to be endured, but not to be feared? Is it a name for sickness only, and not a *cause of death*? Quite the reverse, the fact is that, like some individuals of great influence and importance, anæmia travels *incognito*. When we discover its various "*noms de guerre*," we are startled to find ourselves face to face with the impersonation of long-dreaded enemies.

Tabes mesenterica	.	18.3	deaths per week.
Croup	.	6.8	„ „
Measles	.	25.0	„ „
Hydrocephalus	.	32.5	„ „
Whooping-cough.	.	51.1	„ „
Pneumonia	.	60.3	„ „
Dentition	.	12.8	„ „
Diarrhœa	.	17.5	„ „
Convulsions	.	36.5	„ „
Bronchitis	.	64.5	„ „
Childbirth	.	4.3	„ „
		<hr/>	
		329.6	

These are some of the names under which anæmia travels among the sick, and takes its place in the bills of mortality. The way in which it does so is as stealthy as it is deadly. I will tell you something of how it happens.

"Among the children of the poor of London, the most widely-spread of these diseases (tuberculosis, scrofulosis, rickets,) is *rickets*. It is, however, by no means limited to the poor, or to London, or even to large towns." I quote from one of the most correct medical philosophers of

modern times.—(Sir W. Jenner, "LECTURES ON RICKETS," *Medical Times and Gazette*, March 17, 1860).

"Rickets is essentially and purely a disease of nutrition, not of one part only, but of the whole body.

"Rickets causes, primarily or secondarily, more deaths than any other disease of childhood.

"The great causes of death in rickets are:—1. Intensity of the general cachexia. 2. Catarrh and bronchitis. 3. Albuminoid infiltration of organs, especially of the lymphatic glands and spleen (but also of the liver). 4. Laryngismus stridulus. 5. Chronic Hydrocephalus. 6. Convulsions. 7. Diarrhoea."

You see how closely this list of the causes of death in rickets corresponds with the list I have just given of what I have called the "*noms de guerre*" of anæmia; and the correspondence is really closer than it appears at first sight.

"The connection between rickets and *laryngismus stridulus*," continues Sir William, "is very close. . . . I believe the reason of laryngismus stridulus being so constantly referred to *teething* is that the rickety condition retards the development of the teeth, and the medical practitioner refers the laryngismus to that which, like itself, is the consequence of constitutional disease.

"If a child pass over the ninth month without teeth, you should carefully inquire into its cause. . . . It may be, and this is infinitely the most common cause of late dentition, that the child is rickety."

Many deaths, therefore, registered under the head of DENTITION, may be referred to *rickets*.

"Catarrh and BRONCHITIS," says Sir William, "are unquestionably the most common causes of death in rickets. The softening of the ribs rendering the mechanical power by which inspiration is performed so defective, that the

impediment offered to the entrance of the air by the mucus in the bronchial tubes cannot be overcome; and collapse of large portions of the lung follows.

“This want of inspiratory power, and the consequent accumulation of mucus in the bronchial tubes, affords an explanation of the extraordinary mortality of *measles*, *whooping cough*, and bronchitis in rickety subjects.”

Thus may we refer two more of the headings of the Registrar—MEASLES and WHOOPING COUGH—to rickets.

For similar reasons, and still more from the intensity of the general cachexia and the corresponding defect in the vital force, rickets will be found to be the true cause of fatality in many of the deaths registered under the name of PNEUMONIA.

Then we have the deaths from CHILDBIRTH 4·3 per week, and it is very interesting to trace out the influence of rickets in causing these miserable deaths. The mode of its operation is twofold. First, there is the large size of the head in the rickety foetus; and, secondly, deformities of the pelvis in women who have been rickety in their childhood. On examining into the causes of death in childbirth, as carefully collated by Dr. R. Collins, of the Dublin lying-in hospital, I find that of eighty-one cases of death during parturition, thirty-two were due to rupture of the uterus, eleven to tedious or difficult labour. If we, then, inquire into the causes of rupture of the uterus and tedious or difficult labour, to which forty-three out of eighty-one deaths were due, we find that narrowing and deformity of the pelvis, and abnormal size of the child's head, stand prominently forward in their importance; and thus we are brought back to rickets as the chief cause of these deaths.

But you will perhaps ask, how anæmia is proved to be the cause of the deaths under these different headings, by

proving that they are due to rickets? That is, in fact, the important question. The answer is this, *that anæmia in the mother produces rickets in the child, and anæmia in the child may lead to rickets also.* This may be as familiar to you all as it is to me; but I will give you the authority of Sir William Jenner again, who has devoted great attention to this subject:—

“The health of the mother has a decided influence in the development of rickets in the offspring. . . . Of this much, I am sure—that when the mother is in delicate health, in a state of which *anæmia and general want of power* form the prominent features, without being the subject of disease usually so-called, there the children are often in a very decided degree *rickety*, although the father is in robust health, and the hygienic conditions in which the children are placed are most favourable. It is very common for the first two or three children to be free from any signs of rickets, and yet for every subsequent child to be rickety.

“Whatever external conditions are favourable to the formation of hydræmic blood in a child, seem to be favourable to the development of rickets.

“Albuminoid infiltration of the lymphatic glands, spleen, and other organs is by no means an uncommon cause of death in rickets. The two great features, during life, of albuminoid infiltration of these organs in a young child, are emaciation and pallor; *the anæmia* is often most remarkable.”

You will not fail, then, to see at once the intimate connection between rickets and anæmia, and between anæmia and that list of terrible names in the Registrar's Reports.

I do not wish you to suppose that I attribute *all* the deaths under those headings to anæmia: that would be a

great mistake. But from an elaborate and careful analysis of such deaths, I have found, and you may find, that a very large, a very remarkably large, proportion of them are due to anæmia in the individual, or to anæmia in a parent and rickets in the offspring. It is important to bear in mind, that, with the exception of hydrocephalus, the diseases I have enumerated from the mortality-tables are extremely common every-day complaints,—that they occur and *terminate favourably* thousands of times every year; that it is only *the fatal cases* that come into our list, and with which we are now concerned. And what I have endeavoured to show, and what I wish to impress upon you is, that we must look to anæmia as the chief cause of this *fatality*; that it is anæmia in the individual or anæmia in a parent that brings these remediable, every-day complaints into the bills of mortality.

When, therefore, we see anæmia establishing itself, as a vestige of the diseases from which our convalescents have lately suffered, or in any other way, we must regard it as the grim harbinger of death in a vast family of diseases.

The next example I shall give is *Fatty degeneration* which like the last does not appear in the Registrar's Reports.

CHAPTER XI.

FATTY DEGENERATION.

In the present day, we have all learnt that "something much more than a general tendency to form fat, or a general excess of fat in the blood is necessary to produce a local fatty degeneration."—(Sir James Paget's *Lectures*, Vol. I., p. 112).

Every year throws new light on the physiology of the process by which this change is brought about; but of this it is not within the province of these Lectures to treat. I wish, however, to point out to you that the pathological condition termed fatty degeneration is to be regarded as a *vestige of disease*—a vestige of perverted assimilation, either local or general, and hence a vestige also of any diseases by which such perverted assimilation is produced. In the third series of *Guy's Hospital Reports* (Vol. iii. 1857), Dr. Wilks has related a number of interesting cases of fatty degeneration, of which the only appreciable and probable causes were hæmorrhage, diarrhoea, miasmata. In these cases the subjects were comparatively young, the heart was the organ in which the diseased change was most marked, and the body generally was neither fat nor wasted.

Fatty degeneration appears to be especially prone to occur in tissues which have passed from a condition of active assimilation to one of comparatively inactive or feeble nutrition, by whatever cause this change may have been brought about. Thus, the muscular tissue is particularly subject to fatty degeneration; it is also peculiar for the vigour of its normal assimilation, and it is when

this is rendered feeble that degeneration occurs. This appears to be the case whether the vigorous assimilation is hindered by arrest of function in the muscles, as in the case of paralyzed limbs, or by deficient supply of blood, as in disease of the nutrient arteries of a part, or by a depraved condition of the blood supplied to the part, as in the case of persons who, after having led active muscular lives, gradually become anæmiated by passive hæmorrhages. I have seen many instances of strong men, accustomed to vigorous country occupations, who, having become the subjects of bleeding hæmorrhoids, by which the blood lost its red globules, and nutrition became enfeebled, suffered from degeneration of their previously strong and vigorous hearts. Many other examples might be adduced of the degeneration of tissues when their assimilation is changed from a vigorous to a feeble state. Thus we find, in watching the course of diseases of the heart, that the heart which has become hypertrophied in opposing some obstruction to the circulation during the *active* life of the individual, becomes degenerated when, in the further progress of the case, the patient is forced to relinquish active pursuits, and thus ceases to call upon the hypertrophied organ for the full exercise of its muscular power. Thus, also, parts which have been inflamed are especially liable to degenerate, and fatty degeneration frequently takes place in organs deprived of their proper functions by disease, as in kidneys spoilt by Bright's disease. Thus, also, the products of inflammation, when they have no further functions to perform, are peculiarly subject to fatty degeneration. Without pressing the subject further, I think we shall all agree that fatty degeneration must be regarded as a vestige of disease, not as a disease in itself, and that in thus regarding it, we

must often look beyond the defect in assimilation to the causes of that defect, in order to find the disease of which the degeneration is truly a vestige.

I must now proceed to show to what a wide extent this vestige of disease acts as a cause of those deaths classed in the Registrar's reports under the heads of a variety of diseases.

"The most interesting examples (of fatty degeneration)," says Sir James Paget, "are those of *primary degeneration of blood-vessels*. This has long been known in the *atheromatous disease*, as it was called, of the larger arteries, the true nature of which, as a fatty and calcareous degeneration of the inner and, consecutively, of the middle arterial coat, was discovered by Mr. Gulliver (see *Med. Chir. Transactions*, Vol. XXVI.) The descriptions of this complaint by him and by Rokitsansky have left nothing unsaid that is yet known; but the observations are each year becoming more numerous and more interesting of similar changes in the minutest blood-vessels. Such changes are especially observable in the minutest cerebral vessels, and their importance in relation to APOPLEXY, of which they seem to be the most frequent precedent, cannot be overstated."—(*Ibid.*, Vol. I., p. 139).

Dr. Wilks' experience has taught him that, "In the majority of cases of sanguineous apoplexy, disease of the blood-vessels exists."—(*Lectures on Pathological Anatomy*, 1859).

Dr. Kirkes has shown (*Med. Chir. Transactions*, Vol. XXXV.) that PARALYSIS, consequent upon arrested circulation in some portion of brain, is frequently the result of the obstruction of healthy cerebral arteries by masses of fibrine carried into them, after being dislodged from the valves of the left side of the heart, or from some part of the arterial system.

And Dr. Ormerod has pointed out that it is in the cachectic subjects, with feeble circulations, that such masses are likely to form in the heart, in the very persons, in fact, who are likely to be the subjects of fatty degeneration of this organ.—(*Observations on the Clinical History and Pathology of one form of Fatty Degeneration of the Heart*, by E. L. ORMEROD, M.D. *Medical Gazette*, 1849).

And although Dr. Ormerod was not prepared at that time (1849) to consider the occurrence of fibrinous clots in the subjects of fatty degeneration to be more than a frequent coincidence, we do not now doubt that the languid circulation, and the inefficient contractions of the heart in the subjects of fatty degeneration, act, together with other circumstances, in causing these deposits of fibrine from the blood.

Describing the appearances after death in fatal cases of DELIRIUM TREMENS, Dr. Wilks says, "The body, as a rule, presents many degenerative changes, brought about by the intemperate habits. It is this alteration of the viscera, I think, to which death is owing. Delirium tremens is a recoverable affection until such changes have occurred in the tissues that improvement is no longer possible; and we then find in the body various morbid changes. These are mostly of the *fatty* kind, as all alcoholic drinks tend to this condition."—(*Ibid.*)

In ANGINA PECTORIS, again, Dr. Wilks, in common with other observers, has found that "the heart is usually fatty, and the coronary arteries ossified."—(*Ibid.*)

"It is impossible," says Dr. Ormerod (*Op. cit.*), "to read any collection of cases of angina pectoris without feeling how much further fatty degeneration goes to explain the symptoms than does any other morbid change usually found on dissection."

Sir James Paget classes the heart and arteries first among the frequent seats of fatty degeneration.—(*Op. cit.*, Vol. I., p. 116).

Among the vessels of which the coats have been found degenerated are those of the lungs and placenta; and pulmonary or uterine hæmorrhages may result from this state of the vessels.

Against the extreme vital depression which accompanies such diseases as PERITONITIS, INFLUENZA, and DIARRHŒA, the subjects of fatty degeneration have no resisting power; they are among the first to succumb; and thus fatty degeneration becomes a cause of death in these and other depressing diseases when they attack adults.

Out of 164 deaths from CHILDBIRTH in the Dublin Hospital, during the seven years ending November, 1826, as recorded by Dr. R. Collins, I find thirty-two attributed to rupture of the uterus, and eleven to tedious or difficult labour. Recent investigations into the causes of rupture of the uterus, show that fatty degeneration of its walls is a most frequent if not a constant coincidence.

Fatty degeneration of the uterus, then, is a cause of death in childbirth by producing or disposing to rupture of the organ; but it has yet another influence on these deaths, for we may be quite sure that a degree of degeneration must often exist, not sufficient to lead to rupture, but quite sufficient to render the organ incompetent to vigorous muscular contraction, even under the influence of unusual stimuli. And thus it may become the cause of those hopelessly tedious labours which, as we have seen, assist to swell the death-rate in parturition.

Thus do we see that among the rational causes of dread that haunt the brain of the accoucheur during a tedious

labour, fatty degeneration of the uterus has a right to stand foremost.

In PNEUMONIA, Dr. Wilks say that, in "far the majority of fatal cases, some pre-existing and more chronic disease is found in some organ of the body."—(*Op. cit.*)

Speaking of the probabilities of death in pneumonia, Dr. Walshe has made the following very well-considered observation :—

"There are certain other circumstances (besides treatment) beyond the control of the physician, which exercise a most indubitable influence on the issue (of pneumonia). Among these, the pre-existence of *organic disease and the state of health generally of the individual* hold an important place. But of all the collateral conditions, *age* is the most important. While at the two extremities of life, in the new-born infant and in the octogenarian, pneumonia is almost inevitably fatal, the mortality between the ages of six and twelve years scarcely exceeds two-and-a-half per cent."—(*Manual of Diseases of the Chest*, 2nd edition, p. 438).

To this I would add, that the octogenarian may be represented at any period of life by the subject of fatty degeneration.

I need hardly remind you that, in protracted CHRONIC BRONCHITIS there is no one feature more fearfully prognostic of a fatal issue, sooner or later, than the co-existence of fatty-degeneration.

In speaking of SENILE GANGRENE, Sir James Paget says it occurs, "as its name implies, in the old, and often in those who are *old in structure*, rather than in years; it affects tissues already degenerate. I think that, in some cases, its beginning may be when the progressive degeneration of the part has arrived at death. But, if

this do not happen, some injury or disease, even a trivial one, kills that which was already nearly dead, as a *severe* injury might kill any part, however actively alive.”—(*Op. cit.*, Vol. I., p. 461).

Under the heads of LIVER-DISEASE, JAUNDICE, and KIDNEY-DISEASE, I may mention some interesting cases examined by Rokitsansky. (*On Fatal Steatosis—Fatty Degeneration—of the Liver and Kidneys.*)

“The cases referred to consisted in steatosis of the liver, accompanied by a high degree of steatosis of the kidneys. Their importance rests upon the possibility of proving them to be parallel to the cases of acute atrophy of the liver, and the analogous renal affection which co-exists with it.

“It is evident that in our cases we have not to deal with that steatosis of the liver which occurs so commonly in the course of consuming suppurative processes, but with *fatty livers*, as they not rarely develop themselves to a high degree, at the side of an abundant formation of fat in the areolar tissue, without the disease being always attributable to gross feeding.

“There exists thus a *steatosis of the liver*, occurring in individuals inclined to the formation of fat, to which sooner or later a *steatosis of the kidney* is added, both which diseases attain slowly and imperceptibly so high a degree that, finally, a cessation of the biliary and urinary secretion supervenes, and, after a slight degree of icterus, death rapidly sets in from anæmia and a hæmorrhagic decomposition of the blood.”—(*Ranking's Abstract*, Vol. XXXI., p. 40).

I might prolong this subject much further—so widely spread is the influence of this seemingly spontaneous atrophy, this Vestige of disease. I might give you quota-

tions from reliable authorities to show in how many more diseases than I have yet referred to, the *fatality* is determined by fatty degeneration; but I should exhaust your patience and overstep our time. I will, therefore, conclude the list by simply enumerating the causes to which death was attributed in sixty-eight cases analysed by Dr. Quain, in all of which there was fatty degeneration.—(*Med.-Chir. Transactions*, 1850).

List of causes to which death was attributed in sixty-eight cases of fatty degeneration.

Rupture of the heart.	Cancrum oris.
Exhaustion.	Gradual decay.
Coma.	Lethargie.
Pleuropneumonia.	Hæmorrhage into the pericardium.
Syncope anginosa.	Cerebral hæmorrhage.
Cardiac apoplexy.	Diarrhœa.
Syncope.	Gangrene of the intestines.

I must briefly remind you, in the words of Sir James Paget, that “Fatty degeneration of the heart often introduces unexpected dangers into the *ordinary practice of surgery*. It is, I believe, not rarely the cause of sudden death after operations. It is one of the conditions in which chloroform should be administered with more than ordinary caution. They who labour under it may be fit for all the ordinary events of a calm and quiet life, but they are unable to resist the storm of sickness, an accident, or an operation.”—(*Op. cit.*, Vol. I., p. 129.)

To sum up; we have seen that this vestige of disease, fatty degeneration, may claim as its victims a certain number of deaths out of each of the following headings of the Registrar’s report:—

Apoplexy . . .	26·0	deaths per week.
Paralysis . . .	23·7	„ „
Delirium tremens and intemperance . .	4·5	„ „
Angina pectoris and other diseases of the heart . . .	31·9	„ „
Pneumonia . . .	60·3	„ „
Diarrhœa . . .	17·5	„ „
Mortification . .	4·6	„ „
Influenza . . .	3·1	„ „
Peritonitis . . .	4·4	„ „
Childbirth . . .	4·3	„ „
Bronchitis . . .	64·5	„ „
Jaundice . . .	2·8	„ „
Liver disease . .	11·0	„ „
Kidney disease . .	4·9	„ „

263·5 deaths per week;
out of which fatty degeneration claims so large a share.

CHAPTER XII.

ABNORMAL PHYSIOLOGICAL STATES.

WE pass on, Gentlemen, to another and most important branch of our subject.

I must now speak more at length of those *states of health* to which I referred in my second Lecture, when I said that I should impress upon you that “they are intimately related to the definitely marked diseases”—those states so puzzling to the young practitioner, because they do not fall under any of the nosological headings which have been his landmarks in the study of disease—those states which, although perhaps familiar in their aspect to most old practitioners, are, nevertheless, most inefficiently treated, or not treated at all, because their interpretation is so little understood, and because their importance is not appreciated; *conditions which are not recognised as disease, but which certainly are not health*, and which I propose to class under the general heading of “ABNORMAL PHYSIOLOGICAL STATES.” I will give you some examples of what I mean.

A family of four children were exposed to the infection of measles at the same time, and from the same source; all of them *were supposed to be in health at the time*. One had the measles simply and slightly; one had a severe attack of pneumonia combined with it; one indicated a disposition to typhoid symptoms, and was completely oppressed by the morbid poison; a fourth lingered in convalescence, and was found to have become the subject of a deposit of tubercles in the lungs.

A party of friends, all *apparently* in what is called

health, met at a funeral; they went together into a damp unwarmed cemetery chapel on a raw winter's day, and returned together, one and all complaining that they had taken "a severe chill." They dined together and went to their homes. One suffered an attack of rheumatic fever; one had anasarca; one jaundice; another bronchitis; a fifth pneumonia; a sixth diarrhoea; a seventh had erysipelas; and another had pleurisy. One coughed up a quantity of blood; while the rest got a restless night, and a cold in the head, and thought no more about it. These are no imaginary stories; analogous cases frequently occur within the experience of medical men in large practice. But what is their interpretation? Why did the same cause—the chill—produce such different effects, under external conditions, apparently the same? No doubt, the first answer which suggests itself is, that the circumstances, so apparently the same, must have been really different. Well, Gentlemen, I will admit that, as the first step towards solving the difficulty. But I will insist that in a given case, the cause, so far as the chill is concerned, shall be the same in each individual; and the circumstances, so far as they are external, shall be the same for each individual. Nevertheless, these different effects shall be produced; and the reason we shall find to be this, that there are other causes and other circumstances, different in each case, existing *within the organisms* of the sufferers, with which *the one cause*—the chill—has to combine in producing its effect, and that the effect is the result of this combination of causes, different in each individual.

Some of you, perhaps, will say that this simply means that the different effects are explained by the different *idiosyncrasies* of the individual. And I must warn you against adopting a word as the explanation of a difficulty, lest in doing so, you fail to investigate the multitude of

facts which that word may represent. I have no objection to the word, so long as you bear in mind that you must be able to explain what it means, if it is to be accepted as any explanation at all. Professor Bernard has spoken well on this subject: "I discovered," he says, "that section of large divisions of the sympathetic nerve was apparently unattended with the slightest inconvenience, *as long as the health of these animals* (rabbits) remained perfect.....but as soon as a general debilitation of the system arose from want of proper nourishment, acute inflammation was produced in the organs deprived of nervous influence. We had, therefore, succeeded in artificially creating particular *idiosyncrasies* in these animals, and could predict with certainty, that, as soon as health failed, disease would arise at a given point. Morbid predispositions must, therefore, be viewed in the light of peculiar physiological conditions." And he concludes thus: "Let me advise you not to consider idiosyncrasies in the light of mysterious powers residing within the depths of our organs, nor as entirely novel functions superadded, as it were, to those which already exist. They must be viewed as mere manifestations of the ordinary laws of physiology."—(BERNARD, *Lecture V., Medical Times and Gazette*).

Health, Gentlemen, is *the normal physiological state*; and peculiarities in, or divergencies from this condition must be regarded as greater or less deviations from *health*, (abnormal physiological states) in proportion as they predispose to contingencies which increase the probabilities of death before the normal term.

There are very few persons who pass through life in the normal physiological state. At some period of life almost every individual diverges, more or less, from this state in one direction or another; and during that diver-

gence, although escaping an attack of what is recognised as disease, he certainly *is not in health*; and in almost every individual there is a tendency to diverge in some particular direction, during which divergence—*i.e.*, during that period of *deranged health*—he is particularly prone to certain classes of disease. In the case I have taken as an example of the effects of chill for instance:—the man who had rheumatic fever, was already surcharged with acid. He who had jaundice was suffering from defective excretion by the liver, requiring only a certain increase in the defect, or of the demands upon the excreting function, to throw the secretion back into the blood. The patient who had anasarca was suffering either from hydræmia, or from defect in the excreting powers of the kidneys. The sufferer from bronchitis I attended myself: he had chronic congestion of the bronchi, from repeated former attacks of bronchitis, and the circulation through his chest was defective, from a feeble, degenerated heart; but he had been accustomed to pass as a man in health, competent to perform the onerous duties of a tax-collector and county-court agent. He who had an attack of diarrhœa, found in his bile ducts or in the intestinal mucous membrane a safety valve, by which he was saved from either anasarca, jaundice, or rheumatic fever. The subjects of erysipelas and pneumonia, and the man who had hæmoptysis, were already suffering from depraved states of the blood, or of the organs to which it was determined; and from which, in the last two cases, it escaped in different quantities; while the patient who was attacked with pleurisy, was surcharged with urea from defective action of his kidneys.

These several persons, therefore, were suffering, 'when they considered themselves in health—before the occurrence of the chill—from *abnormal physiological states* to

which we can attribute the particular form of the disease which was set up, by the addition, in each case, of one and the same cause, viz., the chill.—*But some escaped unhurt!* Because in them the physiological state was sufficiently normal that a resisting and re-actionary power existed, which was competent speedily to restore the functions of the organs subjected to the shock of the chill, and to make them compensate for the temporary arrest by increased activity.

I have chosen this group of somewhat crude examples on purpose, that their meaning may be the more perspicuous. They, most of them, exemplify states of health dependent on the fluids and excretory organs of the body. It would be easy to bring many examples of degraded health consequent on disease attributable to the *nervous* system.

* * * * *

I assume, then, that (in the course of these lectures) I have sufficiently demonstrated that the *vestiges of disease stand first among the causes of death.*

I have shown that so long as these vestiges exist they are causes of defect in the vital force, and thus act as factors of the essential and of the predisposing causes of fresh attacks of disease.

I have shown that the diseases, from which these vestiges result, are but the manifestations of pre-existent physiological states, to which, by some means, the last condition has been supplied, necessary to complete the conditions of existence proper to the disease, which then is developed in its characteristic features.

I have shown that these ABNORMAL PHYSIOLOGICAL STATES are indicated by the various conditions of impaired general health, “conditions not recognised as disease, but which certainly are not health.”

The sum of it is this :—

1. The majority of diseases which we see excited by the various accidents of life are but the *manifestations* of pre-existent abnormal physiological states, which required only this last condition (the accident of life) to complete their development into the characteristic features of disease.

2. Those conditions “not recognised as disease, but which certainly are not health,” are the faint expressions of these morbid physiological states, while still deficient in the condition necessary to complete their development into the recognised features of disease.

3. The multifarious and anomalous functional derangements which puzzle the physician, and make martyrs of the patients, depend, for the most part, upon the influence exerted by these morbid physiological states over the ordinary incidents of animal existence, which are thereby modified, coloured, and distorted.

4. During the whole of the time that the physiological conditions are disturbed, there is a greater or less defect in the vital force, and this defect, therefore, exists at a period anterior to what are usually understood as structural changes.

I have shown that these abnormal physiological states, recognisable under various forms of impaired health and attended by a legion of anomalous symptoms, may be traced back to still earlier periods in their history, when they require the greatest vigilance of the physician to detect any deviation from the standard of normal health.

Then I endeavoured to show in what direction we must look for the causes of these earliest and most occult deviations from the normal physiological state.

With this intention I pointed out that the “conditions of life” and the “vestiges of disease” have a direct in-

fluence on the vital force; that the alterations in it are transmissible to the germs of a succeeding generation; and that thus defects of force may be due to abnormal conditions of life in the individual, and to the vestiges, or vestiges of vestiges of disease in an ancestor. And I wish to draw your marked attention in this place to the fact, that it is to these *defects transmitted from an ancestor*, and to the *conditions of life in the individual*, that we must especially look for the causes of those first *insidious deviations from health*, which I have called "abnormal physiological states."

As I have shown that these incipient and insidious degradations of the vital force exist at a period anterior to such changes as are understood by the terms structural and organic, I think you will now understand why I said in my last Lecture, that there could be no fact in Medicine of greater practical importance than this. My reason was—that the very dependence upon the *conditions of life* which exposes the force in the individual to degradation under *unfavourable* conditions, must render it amenable to *elevation* under the influence of conditions which are favourable. And thus we learn that there is a *possibility of cure* in states that would otherwise be beyond the reach of treatment.

APPENDIX.

I.

ALCOHOL.

(*Leading Article from the LANCET, January 1st, 1870.*)

“After a great many fluctuations, professional opinion upon the question of alcoholic stimulation in disease appears to have recently achieved some real progress towards the establishment of satisfactory principles. There are still very wide divergencies between different authorities, and we fear that there is still a good deal of extreme and irrational practice, both in the direction of excessive stimulation, and of the opposite fault of an unreasonable fear of the remedy. But it seems to us that the outlines of a greatly improved knowledge, both of the therapeutic powers, and the capacity for mischief which alcohol possesses, may now be discerned.

“In the first place, as regards *acute* diseases attended with febrile phenomena, three things are tolerably plain. The first is, that alcohol when it acts well, acts as an antiphlogistic stimulant; that is to say, it lowers abnormally high temperature, it reduces the frequency of the pulse, and, while raising nervous power, it calms those disturbances of the nervous system which attend, if they are not caused by, the elevated temperature of the blood in pyrexia. The second great fact is, that there are the utmost differences between different pyrexial patients as to their capacity for receiving benefit in this way; that a large number of persons, especially among the young and previously robust, do best without any alcohol; and that among those to whom it is beneficial, there are some for whom three ounces of wine per diem is fully the physiological and therapeutical equivalent of twenty-four ounces given to another

and smaller class of patients; and that nothing but careful tentative use of the remedy can tell, in any particular case, whether it is needed, and, if so, in what quantities. In short, that all generalisations to the effect that you must, or must not, give wine by ounces, or by bottles, in fevers or in inflammations generally, are worthless and misleading. The third settled fact is this, that it is often in those cases where alcohol used (on purely theoretical grounds) to be thought most dangerous—*viz.*, in cases with very high temperature and flushed face—that it produces its best effects; and that to pour large quantities of stimulants into a fever patient simply because he is pale, and has a small pulse, is an unwarrantable proceeding.

“The above are *certainities* and the following are *probabilities*.

“It is probable that alcohol owes part of its influence in fevers to an antiseptic agency, by which it destroys the activity of certain bodies—call them organisms, or not, as you please—by means of which the *contagium* sets up the febrile disturbance within the blood. In the case of inflammation, it is probable that alcohol, when it acts well, does so in part because it stimulates the sympathetic and contracts the arterioles, and in part interferes with the migration of blood-corpuscles through the vascular walls, as Binz and his pupils have shown that quinine can also do. It is probable that so far as alcohol can be applied to these purposes within the organism, it is of unmixed benefit. And there is much reason to believe that the singular differences between different individuals, as to the quantity of alcohol they can bear, depend on some unexplained difference in the respective rapidity with which alcohol is oxidised in the blood in different persons. For it is now known with certainty, on the one hand, that nearly the whole, even of a poisonous dose, is always oxidised in the body, and on the other hand, that the presence of large quantities of unchanged alcohol for any length of time in the blood, inevitably poisons the nervous system. The antiseptic action, and the influence on the migrative tendency of the corpuscles, are most likely produced immediately that the alcohol mingles with the blood; it probably

depends on the subsequent progress of oxidation whether the general effect on the patient will be good or bad. One thing is certain; if signs of narcotism—*i.e.*, paralysis of the nervous system—are produced, the alcohol is doing harm and must be immediately diminished or stopped.

“As regards *chronic* diseases, we are sorry to observe that there is very much less of intelligent progress in medical opinion than in the case of acute diseases. It is much to be regretted that a large number, even of highly-educated practitioners, will persist in acting on the assumption that in non-febrile diseases the amount of alcohol to be administered ought to be measured by the degree of debility, merely as such. The direct and very mischievous corollary of this is the practice, unfortunately daily increasing, of prescribing stimulants with lavish profusion in those numerous *nervous* affections to which weakly persons (more especially women) are prone. It is our duty, as medical journalists, to raise our voices to the utmost against this tendency. We are no bigots against alcohol; and we are heartily sick of the unthinking abuse which has been lavished on what it is the fashion to call ‘indiscriminate stimulation in acute disease.’ We declare our belief that the real mischief lies at the door of those who are indiscriminate (because they are unthinking and illogical) in their prescription of alcohol for *debility, merely as such*. It is no figure of speech, but the literal truth, when we say that hundreds of neuralgic, hysteric, and epileptic patients have been driven into drunkenness or lunacy, or both, by the careless folly of advisers, who had no better reason for the prescription of large doses of alcohol than the fact that these diseases are attended with nervous weakness as they undoubtedly are. The assumption involved—that so much ingested alcohol is necessarily so much added nervous strength—is so gross a fallacy that no one would assent to it if expressed in plain words. Yet we constantly see it acted upon. We repeat with all the energy of which we are capable, that it is a grave scandal and mischief that medical men should endanger in this serious way the powers of moral

resistance of women and other weak persons while basing their practice upon ideas that are illogical and untenable; and we trust that a reform in this respect will immediately be commenced."

II.

FROM THE PROCEEDINGS OF THE ROYAL SOCIETY No. 120, 1870.

EXPERIMENTS ON THE EFFECTS OF ALCOHOL (ETHYL ALCOHOL) ON THE HUMAN BODY, *By* E. A. Parkes, M.D., F.R.S., *Professor of Hygiene in Army Medical School, and* Count Cyprian Wollowicz, M.D., *Assistant Surgeon, Army Medical Staff.*

"As a knowledge of the physiological effects of alcohol on the human body is a matter of great importance, and as previous observations leave some points in doubt, we took the opportunity which the willingness and zeal of a very intelligent healthy soldier afforded us of investigating this subject.

"In order not to lengthen the paper, we have given only our own observations; without referring to those of others.

"The plan of observation was as follows:—For twenty-six days the man remained on a diet precisely similar as to food and times of meals in every respect, except that for the first eight days he took only water (in the shape of coffee, tea, and simple water); for the next six days he added to this diet rectified spirit, in such proportion that he took in divided quantities on the first day one fluid ounce (= 28·4 cub. centims). of absolute alcohol; on the second day two fluid ounces; on the third day four ounces, and on the fifth and sixth days eight ounces on each day. He then returned to water for six days, and then for three days took on each day half a bottle (= 12 ounces, or 341 c.c.) of fine brandy, containing 48 per cent. of alcohol. Then for three days more he returned to water.

"There were thus five periods, viz. of water-drinking, alcohol, water, brandy, water.

"Before commencing the experiments, the man, who had been accustomed to take one or two pints of beer daily, abstained altogether from any alcoholic liquid for ten days.

"This man, F. B., is twenty-eight years of age, 5 feet 6 inches in height, and his usual weight is 134 or 136 lbs. He is finely formed, with little fat, and with largely developed powerful muscles; he has a clean smooth skin, a clear bright eye, good teeth, and is in all respects in perfect health. He is very intelligent, and assisted us so much that we are quite certain that there has not been a mistake even for a minute in the time of taking the temperatures and passing the urine. As he had always been accustomed to smoke, we thought it proper to allow him half an ounce of tobacco daily, for fear the deprivation of it might disturb his health.

"In addition to the experiments recorded in this paper, we tested the accuracy of his vision, and the muscular power before and during the use of alcohol; but as we could not detect any difference, we do not give the experiments.

"Our object being to test the dietetic effects of alcohol, we gave it in small and large quantities, but avoided producing any extreme symptoms of narcetism. (Here follow in the original paper twenty-seven pages of carefully detailed experiments)."

GENERAL CONCLUSIONS.

"1. One and two fluid ounces (28·4 c. c. and 56·8 c. c.) of absolute alcohol given in divided quantities in 24 hours to a perfectly healthy man seemed to increase the appetite. Four fluid ounces lessened it considerably; and larger quantities almost entirely destroyed it. On the last day of alcohol the man was three quarters of an hour eating 8 ounces of bread, and could hardly do so. Had he been left to his own wishes the amount of food taken would have been much diminished.

"It appears, therefore, that, *in this individual, some point near two fluid ounces of absolute alcohol is the limit of the useful action on appetite; but it is possible that if the alcohol had*

been continued a smaller quantity would have lessened appetite.

"In other healthy persons it may be different from the above; in most cases of disease, when digestion is weakened, it seems probable that a much smaller amount of alcohol would destroy appetite.

"2. The average number of beats of the heart in 24 hours (as calculated from 8 observations made in 14 hours) during the first or water period was 106,000; in the alcoholic period it was 127,000 or about 21,000 more; and in the brandy period it was 131,000 or 25,000 more.

"The highest of the daily means of the pulse observed during the first or water period was 77.5; but on this day two observations are deficient. The next highest daily mean was 77 beats.

"If instead of the mean of the 8 days or 73.57 we compare the mean of this one day, *viz.*, 77 beats per minute, with the alcoholic days, so as to be sure not to over-estimate the action of the alcohol, we find:—

"On the 9th day, with 1 fluid ounce of alcohol, the heart beat 4,300 times more.

"On the 10th day, with 2 fluid ounces, 1,872 times more.

"On the 11th day, with 4 fluid ounces, 12,960 times more.

"On the 12th day, with 6 fluid ounces, 30,672 times more.

"On the 13th day, with 8 fluid ounces, 23,904 times more.

"On the 14th day, with 8 fluid ounces, 25,488 times more.

"But as there was ephemeral fever on the 12th day, it is right to make a deduction, and to estimate the number of beats in that day as midway between the 11th and 13th days, or 18,432. Adopting this, the mean daily excess of beats during the alcoholic days was 14,492, or an increase of rather more than 13 per cent.

"The first day of alcohol gave an excess of 4 per cent., and the last of 23 per cent., and the mean of these two gives almost the same percentage of excess as the mean of the 6 days.

"Admitting that each beat of the heart was as strong during the alcoholic period as in the water period (and it was really

more powerful), the heart on the last two days of alcohol was doing one-fifth more work.

"Adopting the lowest estimate which has been given of the daily work done by the heart, *viz.*, as equal to 122 tons lifted one foot, the heart during the alcoholic period did daily work in excess equal to lifting 15.8 tons one foot, and in the last two days did extra work to the amount of 24 tons lifted as far.

"The period of rest for the heart was shortened, though perhaps not to such an extent as would be inferred from the number of beats; for each contraction was sooner over.

"The heart on the fifth and sixth days after alcohol was left off, and apparently at the time when the last traces of alcohol were eliminated, showed in the sphygmographic tracings signs of unusual feebleness; and, perhaps in consequence of this when the brandy quickened the heart again, the tracings show a more rapid contraction of the ventricles, but less power than in the alcoholic period. The brandy acted, in fact, on a heart whose nutrition had not been perfectly restored.

"The peripheral circulation was accelerated and the vessels were enlarged; and the effect was so marked as to show that this is an important influence for good or for evil when alcohol is used.

"Referring only to this healthy man, it is clear that the amount of alcohol the heart will bear without losing its healthy sphygmographic tracing is small, and it must be supposed that some disease of the heart or vessels would eventually follow the overaction produced by large doses of alcohol.

"3. Although large doses of alcohol lessened appetite, they did not appear to impede primary digestion, as far as this could be judged of by the sensations of the man; nor did they seem to check the normal chemical changes in the body which end in the elimination of nitrogenous excreta, of phosphoric acid, and of free acidity. In other words, we were unable to trace either the good or the evil ascribed to alcohol in this direction; it neither depressed these chemical changes nor obviously increased them; it neither saved the tissues nor

exhausted them; and even in the period of ephemeral fever its effects were negative.

"But, of course, in these experiments we were not dealing with diseased tissues, nor with structures altered in composition by long-continued excess of alcohol. The results in such cases might be different; and it may be desirable to repeat that though the appetite was lessened, the amount of food taken was the same each day.

"4. Neither pure alcohol nor brandy, in the quantities given, lessened the temperature; in other words, they did not arrest the chemical changes which produce animal heat, or lessen the processes which regulate its amount, any more than they influenced nitrogenous tissue-change. Alcohol in no way influenced the rise of temperature during the attack of ephemeral fever; it neither lowered nor increased it. This appears to us conclusive against the proposal to use alcohol as a reducer of febrile heat. (See Appendix, No. 1.)

"On the other hand it is not clear that alcohol increased the temperature; it produced subjective feelings of warmth in the stomach, in the face, round the loins, and over the shoulders; but at the time when these were felt (for about one hour after tolerably large doses) the thermometer in the axilla and rectum showed no rise. This is best seen by comparing the two o'clock observations, which were taken about half an hour after dinner. The feelings result from the enlargement of the vessels and the greater flow of blood through them; so, also, the ephemeral fever was decidedly not made worse by it.

"5. An effect on the nervous system was not proved by any evidence of increase or decline in the amount of phosphoric acid; but there were marked subjective feelings; and possibly also the increased action of the heart was a nervous condition, as the short contractions of the ventricle were like those ascribed to alterations in the nervous currents. The feelings which were produced by four fluid ounces daily, and in a still higher degree by the larger quantities of alcohol, proved that narcotism was produced. There was no exhilaration, but a degree of heaviness.

ness, indisposition to exertion, and loss of cheerfulness and alacrity ; there was slight headache, and even some torpor and sleepiness. All these effects were more marked with brandy. The commencement of narcotism was therefore produced in this man by some quantity much less than 4 fluid ounces, and probably nearer 2. It was nearly this amount which also commenced to destroy the appetite; and it may also be observed that a considerable rise in the frequency of the pulse occurred on the third day of alcohol, when 4 ounces were taken, whereas on the days with one or two ounces the pulse, though quickened, was so in a much less degree.

“Putting therefore these points together, *viz.*, that the obvious effect on the nervous system (*i.e.* narcotism), the loss of appetite, and a great rise in the quickness and frequency of the heart's beats occurred at the same time, it seems fair to conclude that there must be a relation between the phenomena or, in other words, that all were owing to nervous implication.

“It appears, then, clear that any quantity over two ounces of absolute alcohol daily would certainly do harm to this man; but whether this, or even a smaller quantity, might not be hurtful if it were continued day after day, the experiments do not show. It is quite obvious that alcohol is not necessary for him; that is, that every function was perfectly performed without alcohol, and that even one ounce in twenty-four hours produced a decided effect on his heart, which was not necessary for his health, and perhaps, if the effect continued, would eventually lead to alterations in circulation, and to degeneration of tissues. It is not difficult to say what would be excess for him; but it is not easy to decide what would be moderation; it is only certain that it would be *something under two fluid ounces of absolute alcohol in twenty-four hours.*

“It will be seen that the general result of our experiments is to confirm the opinions held by physicians as to what must be the indications of alcohol both in health and disease. The effects on appetite and on circulation are the practical points to

seize; and if we are correct in our inferences, the commencement of narcotism marks the point when both appetite and circulation will begin to be damaged. As to the metamorphosis of nitrogenous tissues or to animal heat, it seems improbable that alcohol in quantities that can be properly used in diet has any effect; it appears to us unlikely (in the face of the chemical results) that it can enable the body to perform more work on less food, though by quickening a failing heart it may enable work to be done which otherwise could not be so. It may then act like the spur in the side of a horse, eliciting force, though not supplying it.

"The employment of alcohol in health and disease is so great a subject that we should have felt tempted to extend these remarks to some points of medical practice, had it been desirable to do so in this place. We will only say that while we recognize in these experiments the great practical use of alcohol in rousing a falling appetite, exciting a feeble heart, and accelerating a languid capillary circulation, we have been strongly impressed with the necessity for great moderation and caution. In spite of our previous experience in the use of alcohol and brandy, we were hardly prepared for the ease with which appetite may be destroyed, the heart unduly excited, and the capillary circulation improperly increased. Considering its daily and almost universal use, there is no agent which seems to us to require more caution and more skill to obtain the good and to avoid the evil which its use entails.

"We wish to guard ourselves against the supposition that in speaking of alcohol and brandy we refer at all to wine and beer, which contain substances in addition to alcohol, which may make their action in nutrition somewhat different."

FROM THE PROCEEDINGS OF THE ROYAL SOCIETY, No. 123, 1870.

"In the Proceedings of the Royal Society (No. 120) is an account of some experiments with pure alcohol and brandy on a healthy man. This paper is intended as a continuation, with

the substitution in the experiments of red Bordeaux wine (claret) for alcohol and brandy. The same man was the subject of the experiments, and he was placed on precisely the same diet as is recorded in the former paper.

"The experiments were continued for 30 days, the man having abstained from any alcoholic beverage for 16 days previously. During the first 10 days, water only was taken at dinner, during the next 10 days red Bordeaux wine was substituted for the water; 10 fluid ounces (284 cub. centims.) being given on the first 5 days, and 20 fluid ounces (568 cub. centims.) on the last 5 days. The wine was taken at dinner time, at a quarter past 1 o'clock. In the last 10 days water was again given.

"The wine was a good claret, as it was thought best to use a superior wine; it was Haut Brion wine of second growth, of the vintage of 1863, and was sold in London at the price of 60s. per dozen. It contained 11 per cent. of alcohol. The free acidity was equal to about 3 grains per ounce of tartaric acid ($C_4H_6O_6$); the total solids amounted to 21.76 grammes, and the fire-proof salts to 2.359 grammes per litre. Of this amount of salts 2.027 grammes were soluble, and .332 insoluble. In the former, phosphoric acid and chlorine were present in the amounts .145 and .106 gramme per litre respectively; the insoluble salts contained only .0175 gramme of phosphoric acid per litre. In the 10 ounces of wine there were therefore only 0.7 grain of phosphoric acid, and 0.46 grain of chlorine.

"The ash was intensely alkaline, and, when neutralized with standard acid, the alkalinity was found to be equal to 1.679 grammes of tartaric acid ($C_4H_6O_6$) per litre.

"Only two circumstances (except the taking of wine) were different in this set of experiments as compared with the former.

"The first experiments were made in February and March, 1870, when the weather was very cold; the present were made in May and June in very hot and dry weather. The only influence we could trace to this altered condition of climate was

that the amount of water allowed was insufficient, and the man suffered some discomfort from thirst. We could not perceive that any effect was produced on the nitrogenous elimination; certainly there was no diminution.

"The other alteration was that the man had gained 4 lbs. in weight, and was still gaining a little when the experiments were commenced; he continued to do so slowly until the 24th day, when his health began to give way and he lost weight.

"The experiments included the number of the pulse (taken in the recumbent position) every 2 hours from 8 A.M. to 10 P.M., tracings of the pulse and respirations, the temperature of the axilla every 2 hours from 6 A.M. to 10 P.M., the temperature of the rectum four times a day (the observations being taken with the same thermometers as on the former occasion), the amounts of nitrogen, phosphoric acid, chlorine and free acidity of the urine, and the weight, and in the two cases the amount of nitrogen in the stools. (Here follow in the original paper fourteen pages of carefully detailed experiments)."

GENERAL CONCLUSIONS.

"1. The general results of these experiments are in all respects identical with the experiments on alcohol and brandy, that is to say, there was a marked effect on the heart, coinciding tolerably well in amount with the effect produced by pure alcohol in the former experiments; there was no unequivocal alteration of temperature in the axilla or rectum, no alteration in the elimination of nitrogen, for the increase in the last period cannot be credited to the direct effect of the wine; no alteration in the phosphoric acid of the urine; some augmentation of the free acidity of the urine; no alteration of the alvine discharges. In other words, claret-wine in the above quantities cannot so far be distinguished in its effect from pure alcohol. Its most marked effect, the increase of the heart's action, must be ascribed to the alcohol, in great measure, though the ethers may play some slight part.

“But it would be going too far to assert that the dietetic effects of red Bordeaux wine and of dilute alcohol are identical. The difference between them must probably be sought in their effects on primary digestion and assimilation, delicate and subtle influences which experiments like those recorded in the paper do not touch. The influence of the sugar, of the salts, and of the acidity must also be appreciated by other methods. The man himself affirmed that the wine agreed with him better than the alcohol or brandy, but the large quantity he took of these last fluids vitiates the comparison.

“These experiments on wine enabled us to define somewhat better than the previous trials what might be considered moderation for this man. *The 10 ounces of wine, containing about 1 fluid ounce of pure alcohol*, did not cause the least unpleasant feeling of heat or flushing. The 20 ounces (containing almost 2 fluid ounces of alcohol) were manifestly too much. He felt hot and uncomfortable, was flushed, the face was somewhat congested, and he was a little drowsy. Moreover, as already mentioned, alcohol then began to appear in the urine. Therefore he ought certainly not to take much more than 1 fluid ounce of absolute alcohol in 24 hours.

“With regard to the propriety of this healthy man taking any alcohol, we have no hesitation in saying he would be better without it. His heart naturally acts quickly and strongly enough; alcohol increases its action too much, and might lead on to alteration in its condition, or to injury of vessels, if any degeneration were to take place in them. This man had gone through the Abyssinian campaign, and stated that when the force was without rum, owing to deficiency of transport beyond Antalo, he had in no way felt the want of the stimulant, though some of his comrades did. This seems to confirm our opinion, that alcohol for him is not a necessity, and indeed is not desirable.”

III.

Abstract of a Lecture on "DUST AND DISEASE, delivered at the Royal Institution." (From The British Medical Journal, January 29th, 1870.)

"PROFESSOR TYNDALL, in making some experiments on vapours, wished for a current of air quite free from the particles of dust always seen in a beam of sunlight. He tried various means for this purpose; one consisted in passing air through a tube filled with sulphuric acid; another, in passing the air through a tube filled with solution of potash. In each case, particles, capable of refracting light, and rendering themselves visible, were still present. In October, 1868 he hit on the plan of allowing the air to pass over the flame of a spirit-lamp 'The floating matter no longer appeared, having been burnt up by the flame. It was, therefore, organic matter. If the air were sent too rapidly through the flame, a fine blue cloud was noticed. This was the smoke of the organic particles.' The Professor was not prepared for the discovery that the dust of our air was organic. He had always considered it inorganic and non-combustible. M. Valentin now furnished him with a small gas furnace with a platinum tube, which could be heated to redness. Air was passed through this tube when cold, and then when hot. When combustion was perfect, no particles could be detected.

"Further experiments led to still more interesting results. A beam of light was made to illumine the dust of the laboratory, and the flame of the spirit-lamp allowed to play on it. Wreaths of darkness were at once seen to mingle with the flame, just like intensely black smoke. 'When the flame was placed below the beam of light, the same dark masses steamed upwards.' They were at times blacker than the blackest smoke. A red-hot poker placed under the beam produced the same dark wreaths. A large hydrogen flame led to the same result. Smoke was therefore out of the question. What,

then, was the blackness ? Simply that of stellar space resulting from the absence, from the track of the beam, of all matter capable of scattering its light.

“The Professor then remarked: ‘Nobody could, without repugnance in the first instance, place the mouth at the illuminated focus of the electric beam and inhale the dirt revealed there. Nor is the disgust abolished by the reflection that, although we do not see the nastiness, we are churning it in our lungs every hour and minute of our lives.’ The wonder is, that so small a portion of this dirt should appear to be really deadly to man. What is this portion ?

“The lecturer then alluded to the notion, at one time prevalent, that malarious diseases were due to organic matter in a state of decay (fermentation). It was then shown that fermentation really depended on the growth of the yeast-plant. Further, Schwann, in 1837, showed that meat, in contact with air which had been heated, did not putrefy ; and he affirmed that putrefaction was caused by something derived from the air, which could be destroyed by high temperature. The germ-theory of epidemic disease soon followed, and found an energetic supporter in Sir Henry Holland, the present President of the Royal Institution. The spread of cholera and that of small-pox were adduced as instances in support of the germ-theory.

“Professor Tyndall alluded to the difficulty that must be experienced in freeing surgical instruments (a canula, for instance) from the means of carrying contagion, in the presence of an atmosphere such as ours, unless a high temperature were employed, and this is not done. Thus, notwithstanding all the surgeon’s care, inflammation often sets in after the use of such an instrument. When an abscess has been tapped, the pus, which was at first sweet, becomes foetid and swarms with vibrios. Professor Lister’s views were quoted.

“The Professor then said the dust could not be blown away with a pair of bellows ; but, if the muzzle of the bellows were stuffed with cotton-wool, it was found that the air which

escaped was free from particles. Schroeder used cotton-wool as a filter in his experiments on spontaneous generation; and subsequently it was used in those of Pasteur. Since 1868 Dr. Tyndall has used it himself.

“The most interesting and important illustration of such a filtering process is furnished by the human breath. After inspiring a quantity of common air, a long expiration is made through a glass tube across the electric beam. At first the luminous track is uninterrupted. The breath impresses on the floating matter a transverse motion, but the dust from the lungs makes good the particles displaced. After a time however, an obscure disc appears upon the beam, and, at the end of expiration, the beam is, as it were, pierced by an intensely black hole, in which no particles whatever can be discerned. The air, in fact, has lodged its dirt in the lungs. A handful of cotton-wool placed over the nose and mouth during inspiration makes the dark hole in the beam of light appear from the beginning of expiration. A silk handkerchief answers nearly as well, but the filtration is not nearly so perfect as with cotton-wool.

“In conclusion, the use of cotton-wool respirators was strongly advocated.”

IV.

FROM THE PROCEEDINGS OF THE ROYAL SOCIETY No. 97, 1868.

ON THE SPECIAL ACTION OF THE PANCREAS ON FAT AND STARCH.

By Horace Dobell, M.D., &c.

“I have been engaged for several years in experimenting with the secretion of the pancreas. The enquiry of which I now make known the results has reference especially to the mode of action of the pancreas upon fats—a point which has been the subject of investigation by various physiologists ever

since the discovery of the influence of the pancreatic fluid on the absorption of fat by Claude Bernard, nearly twenty years ago.

"In the chemical parts of my experiments I owe much to the efficient aid of my friend Mr. Julius Schweitzer, and to the energy and perseverance with which he carried out my suggestions under many difficulties.

"The objects of my investigations have been as follows:—

"1. To discover the exact character and nature of the influence exerted by the pancreas upon fats.

"2. To discover a means of obtaining and preserving the active principles of the pancreas in a form suitable for experiment in the laboratory, and for administration as a remedial agent.

"3. To discover the effects of the administration of the active principles of the pancreas as a remedial agent in certain wasting diseases, and to test, by an *experimentum crucis*, the truth of a conclusion on this subject, at which I had previously arrived by a process of inductive research.

"I shall not occupy the valuable time of the Society by narrating the many, more or less unsuccessful, experiments, but restrict myself to a concise record of those attended with success.

"Experiments were made with the pancreas of several different animals, but that of the pig was selected for the experiments of which I am about to give the results, as being nearest in the character of its functions to that of the human subject.

"In order to ascertain the normal reaction of the pancreatic juice, and whether this is altered by the length of time that has elapsed since the last meal, the following experiment was made with the assistance of Mr. Schweitzer and of Mr. Harris of Calne, who kindly placed his extensive pig-killing establishment at our service for the purpose.

"On March 22, 1866, forty pigs were killed, and the pancreas of each examined immediately after death; the killing and examination were so rapidly conducted, that the pancreas

was in each case examined while warm from the body; and the killing and examination of the forty pigs in succession occupied less than an hour.

"The pigs were killed ten at a time. The first ten had been fed two hours before they were killed, the second ten five hours, the third ten nine hours, and the fourth ten had not been fed for two days.

"The pancreas in each group presented the same characters in size, colour, and reaction. Each pancreas was cut through so as to lay open the principal duct, but in no case was there any fluid in the duct. Litmus-paper was applied to the interior of the duct and to the divided gland-cells, and on being pressed sufficiently against the tissues to absorb moisture, the paper was in each case reddened where it was moistened. This acid reaction was not found in the fat and muscles of the animal.

"At my request, Dr. Collins examined the reaction of the pancreas in a series of cases at the moment when all the digestive organs were under active excitement. He gave the pigs a good and relishing meal, and while they were eating it, divided the spinal marrow in the neck, so as to destroy sensation in the body. The pigs were immediately cut open, the pancreas removed, and its reaction examined. On August 3rd he wrote me, 'As you requested, I have tried a series of experiments upon the pancreas, parotid, and sublingual glands. The two latter have a decidedly acid reaction, but the pancreas I am not quite so certain about; in one batch of pigs killed in Buckinghamshire it was alkaline, but in another lot in Hertfordshire it was acid.'

"The reaction of the pancreas is always acid when it reaches the laboratory for experiment as quickly as possible after removal from the animal. This we have proved in many hundreds of instances.

"To discover the influence of the pancreas upon fat, the fresh pancreas of the pig, freed from all adhering blood and other extraneous matters, was cut into small pieces, bruised, and mixed with lard; and to this mixture water was gradually

added. In the bruised condition the pancreas had an acid reaction. By stirring this mixture of pancreas, lard, and water, the fatty character disappeared, a thick, white, creamy fluid being formed, which, on standing, solidified into a firm pasty mass. This mass had also an acid reaction. In order to free it from the *débris* of pancreas, it was pressed through muslin, and a uniform smooth creamy emulsion remained. This emulsion rapidly putrefied, but remained a permanent emulsion until putrefaction set in.

"The following are the microscopical characters presented by pure lard before mixture with pancreas, and by this emulsion, which I call 'crude emulsion':—

"1. 'Lard' (pure).—*Aggregations* of ordinary acicular crystals of margarine. No oil-globules. No water.

"2. 'Crude emulsion.'—A tolerably uniform granular mass with *separate* acicular crystals of margarine, oil-globules, and water abundantly distributed throughout the mass. In some places the crystals are aggregated as in No. 1. The granules range from the $\frac{1}{3000}$ to $\frac{1}{15000}$ of an inch in diameter.

"This mixture of fat and water differs from all other mixtures or chemical combinations of fat and water in the following particulars.

"When the 'crude emulsion' is put into ether, the ether separates it into two strata—

a. An ethereal stratum above, containing the fat.

b. A watery stratum below.

"When the upper stratum (a) (ethereal solution of fat) is drawn off and the ether evaporated by a cautiously regulated heat, a pure crystalline fat remains which I call 'pancreatized fat.' This pancreatized fat has no tendency to putrefy, and will keep for an indefinite period. It presents the following characters under the microscope:—

"3. 'Pancreatized fat' (lard) consists of minute *separate* acicular crystals of margarine and fine granular matter uniformly distributed. The special character is the *complete loss* of aggregation of the crystals.

"This 'pancreatized fat' retains the property of mixing or combining with water, and forming a thick, smooth, creamy emulsion, that it possessed in the form of 'crude emulsion' before solution in ether. The emulsion formed by mixture of 'pancreatized fat' with water I call 'purified pancreatic emulsion.' It has, like the crude emulsion, an acid reaction, and will keep for a very long time, and presents the following microscopical characters:—

"4. 'Purified emulsion' (No. 3, spirit and water).—As nearly as possible the same as No. 2; the *separate* crystals more uniformly distributed, and fewer aggregations of them. No globules.*

"On analysis of the lower watery stratum (*b*) resulting from the separation of the fat of the crude emulsion by ether, it is found to contain *no glycerine*.

"On analysis of the pancreatized fat (3) obtained by evaporating the ether from stratum *a*, it is found that 100 parts of the pancreatized fat are saponified by 54 parts of oxide of lead, and yield 146·25 parts of lead-plaster, and 6·75 parts of glycerine.

"It is also found that every 100 parts of lard used in making the crude emulsion produce 106·5 parts of pancreatized fat, the increase of 6·5 parts being solely due to absorption of water, as proved by heating the pancreatized fat, when the water separates, and the pancreatized fat is reconverted into ordinary lard.

"In all the foregoing respects the pancreatic emulsion of fat differs entirely from all other kinds of emulsion of fatty matter, whether chemical or mechanical. All other emulsions of fat are destroyed by ether, the fat being restored at once to its original condition.

"The influence exerted by the pancreas upon fats, therefore, appears to operate by breaking up the aggregation of the cry-

* In cold weather it is necessary to gently warm the glass slide before placing the above specimens upon it, otherwise the solid constituents become agglomerated.

stals of the fat. It alters the molecular condition of the fat, mingling it with water in such a way that even ether cannot separate the fat from the water. A permanent emulsion is thus formed ready to mix with a larger quantity of water whenever it may be added.

"The pancreas, therefore, in acting upon fat, does not decompose it into fatty acid and glycerine, the absence of the glycerine from the watery stratum (*b*), and the presence of the glycerine in the pancreatized fat of the ethereal stratum (*a*), having been demonstrated.

"*Action of the pancreas upon starch.*—It is well known that, in addition to the influence of the pancreas upon fat, it has the power of converting starch into glycose by simple mixture. This property remains to a certain extent after the pancreas has exhausted its property of acting upon fat. The quantity of pancreas which before mixture with fat will convert about eight parts of starch into glycose, after saturation with fat will still convert about two parts of starch into glycose.

"SECOND OBJECT.—To discover a means of preserving the active principles of the pancreas in a form suitable for experiment in the laboratory, and for administration as a remedial agent.

"The properties of the pancreas can be extracted from the tissue of the gland by means of water. This watery fluid putrefies very rapidly. It has an acid reaction, a deep yellow colour, coagulates largely by boiling, leaving the colour of the fluid unaltered. It may be precipitated by lead solution, and decomposed again by sulphuretted hydrogen.

"When this watery fluid is evaporated, it forms a syrupy extract, which is highly hygroscopic and very difficult to dry. With great care and trouble, however, it may be dried. For general purposes, the drying is greatly facilitated by adding a dry absorbing-powder, such as powdered malt. For experimental purposes, it may be used in its pure undried state of syrupy extract, but must in that case be used fresh. In the dry state, either pure or mixed with malt-dust, it may be kept

good for an indefinite length of time, if protected from moisture in a well-closed bottle. This extract of the pancreas, containing the active principles of the pancreas in the highest degree of efficiency, whether fluid or powdered, I call 'PANCREATINE.' This term is only used for convenience' sake, and must in no way be understood to signify that the property possessed by it is *single*. All attempts to isolate the several properties of the pancreas into separate products have failed, no one of such products having been found to possess in perfection the property of acting upon fat in the manner described in this paper as peculiar to the pancreas. By the term 'PANCREATINE,' then, I desire to represent the *entire properties of the pancreas* extracted in a convenient form for keeping, for experiment, and for administration as a remedial agent.

"One part of the pure pancreatine dried, without mixture with malt-dust, will digest at least sixteen parts of lard, and enable it to form a thick creamy emulsion, with about 100 parts of water. The emulsion thus formed presents in every respect the characters and qualities of the emulsion produced by the fresh pancreas already described. In this way therefore the active principles of the pancreas may be obtained and preserved in a form suitable for experiment in the laboratory and for administration as a remedial agent.

"THE THIRD OBJECT of my investigations has especially occupied my attention in a long series of experiments at the Royal Hospital for Diseases of the Chest. Full details of these and of the results obtained have been published from time to time, during the last four years, in the medical journals; I shall not, therefore, occupy the time of the Society with any account of them in this paper.*

* See the Author's work "On Tuberculosis," its nature, cause and treatment, 2nd edit., in which some of the papers here referred to are collected.

V.

ON THE IMPORTANCE AND DANGERS OF REST IN PULMONARY CONSUMPTION. By Horace Dohell, M.D. (*From the British Medical Journal*, Nov. 22nd, 1873).

"HAD not Mr. Heather Bigg brought forward my name as the originator of 'lung-splints' (*JOURNAL*, November 1st, page 530), I should not have thought it necessary, after all that I wrote on the subject in 1866-7, to join in the discussion on the importance of 'rest in pulmonary consumption,' just now excited by the interesting paper of my friend Dr. Berkart.

"My object in now writing is not to enter into the dispute on the question of priority, but to issue a caution to those experimenting, either with Dr. Berkart's bandages or with my 'lung-splints,' lest anyone should think he has my authority for running into dangers which I have been most careful to avoid.

"It was in November, 1872, that, at my request, Mr. Bigg made the first 'lung-splint,' and I asked him to call it at once by this name, as conveying an unmistakable explanation of its objects. He arranged it with his usual skill; it answered admirably, and he has made many others since, adapting each to the special requirements of the case. Before this, I had been accustomed to procure rest for portions of lung by other devices, principally by keeping the arm of the affected side flexed upon the walls of the chest, so as to restrain expansion by its weight and by the absence of muscular action; and it was the difficulty of sufficiently localising the pressure by these means to suit special cases that led me to suggest the 'lung-splint;' but, whether it be partial rest of the whole of one lung, or more complete rest of a portion of one or both lungs that is desired, the greatest caution is necessary; because whatever local means secure rest to one part of the lungs, throw extra work upon the other parts, and may, therefore, easily do more harm than good.

“For this reason, I have always used the greatest circumspection in selecting cases for this kind of treatment, and I trust that, if anyone is led to follow my example in one part of this treatment, he will most scrupulously do so in the other. With this precaution, nothing can be more satisfactory or more common sense, in the treatment of lung-disease, than the use of lung-splints, bandages, and the like; whereas without it nothing can be more foolish.

“The ‘importance of rest in pulmonary consumption’ was a necessary corollary upon my well-known hypothesis as to the nature and cause of tuberculosis, viz., that tuberculisation is peroxidation of albuminoid tissue; and in my work on that subject, published in 1866, and in my ‘Lectures on the True First Stage of Consumption,’ published in 1867, I brought this prominently forward. In enumerating the means of carrying out the ‘second principle of treatment in advanced tuberculosis, viz., to save the albuminoid tissues from disintegration to the greatest possible extent,’ I said, ‘Let respiratory action be reduced to the lowest point consistent with maintaining what remains of appetite and digestive power,’ (*Tuberculosis*, 2nd edit., page 45); and again (page 47), ‘until this point is arrived at—until the balance is turned in favour of the albuminoid tissues—everything which favours the reception of oxygen into the blood, everything which increases the wear and tear of the body, everything which calls for the generation of animal heat, directly favours tuberculisation, and precipitates the patient into the very catastrophe we wish to avert.’

“When discussing the views of Dr. Pollock and of Dr. Edward Smith (*True First Stage*, pp. 70, 71), I said, ‘It will be seen how entirely I disagree with Dr. Pollock in his interpretation of the phenomena which he has so carefully observed. While fully admitting and appreciating the conservative action of the organism in disease, I fail to see an example of it in the wasting of consumption, which appears to me to be the unavoidable effect of an arrest of the supply of an essential material for combustion and for histogenesis—an arrest in the supply of

that for which it is impossible to stop the demand while life continues. On the other hand I can see an example of conservative action in the attempt instinctively made by the patient *to stop this demand by lessening respiration, abstaining from exertion, and seeking artificial heat*—phenomena which Dr. Edward Smith interprets so differently. While fully admitting with Dr. Smith that, in early phthisis, respiration is diminished, I believe that he is totally wrong in his interpretation of its meaning. It is a law of animal nature *to save a tender part*, and I see, in the attempt at lessened respiration in early phthisis, an example of the operation of this law. The blood in the pulmonary circulation is deficient in the materials which the inhaled air seeks, the delicate tissue of the lungs is exposed to injury by the air, through deficiency in its usual protection of fatty blood, and nature comes to the rescue by attempting to diminish the quantity of air that is brought into the unprotected lungs, just as she shuts off the access of light from an inflamed retina by closing the iris or the eyelid.' In referring to climatic treatment, I said (*True First Stage*, page 50), 'the second object of climatic treatment—economy of fat and carbon in the organism, and protection of the lungs from undue oxidation, *i.e.*, provisional protection against tuberculisation—is of the greatest importance We must look for an atmosphere sufficiently warm to save some of the demand for carbon to supply animal heat, and we must look for a place where this warm diluted air can be breathed with as little exercise as possible.' I recapitulate these statements, because it has been under the dictation of the principles to which they refer that I have been accustomed to prescribe REST IN PULMONARY CONSUMPTION, whenever tuberculisation has commenced or is already imminent. First, rest of the whole body; secondly, rest of the whole of both lungs; thirdly, rest of one lung; fourthly, localised rest of diseased portions of lung.

“Those who enter into my views as to the importance of avoiding peroxidation of lung-tissue in consumption, will at once see how dangerous may be the effect of throwing exaggerated ac-

tion upon one portion of lung by the attempt to control the action of another portion. If the disease by which the one portion was damaged had been purely local, there would be no danger, worth considering, in taxing the sound parts to save the unsound ; but, when we consider consumption as ‘an abnormal physiological state’ of the constitution, exposing all parts of the lungs to destructive changes, we at once see how much caution is required in determining that it is safe to throw exaggerated action on parts which may be only needing this excitement to subject them to the same destructive changes as those taking place in the portion of lung we wish to save by localized rest.

“The rules for the cautious application of localised rest in lung-disease which I recommend, as dictated by a consideration of the nature of tuberculosis, and justified by the results of my own practice, are as follows.

“1. If one lung, or a portion of one lung, or a portion of each lung, has become diseased, under circumstances which make it certain that there is no constitutional cause of lung-disease, then it is safe to secure localised rest for the diseased part, and to throw the extra work upon the sound parts ; but even then it is necessary to be cautious that the extent of lung so rested is not too large in proportion to the extent of sound lung upon which the extra work is thrown. If there is any question about this, rest of the whole body must be secured in addition to the localised rest of lung, so as to save the sound lung from as much work as possible.

“2. If there is a constitutional cause of lung-disease, but only a small area of lung at present suffering, and that in the upper lobes, while there is a capacious chest with large areas of lung in the lower portions quite sound and insufficiently used, then it is safe to secure localised rest for both upper lobes, and to make the lower portions do a fairer proportion of the work ; but even under these circumstances, the respiration should be kept at as low a point as practicable. A case illustrative of this rule has just occurred to me. A fine young man, with a very capacious thorax, who has practised all sorts of gymnastic

exercises with his arms while restricting the lower parts of the chest by dress, has thus acquired a habit of breathing almost entirely with the upper portions of lung. He has a tuberculous family history; and, after foolish overtraining, by which he reduced his flesh considerably, he overtaxed his lungs in a race, and he has since become the subject of partial consolidation of the apices and recurrent hæmoptysis. Finding that he has large tracts of scarcely utilised lung at the lower parts of the chest, I have not hesitated to get Mr. Bigg to apply mechanical restraint, by means of lung-splints, to both upper lobes; but I have, at the same time, secured rest for the whole lungs by sending the patient on a long sea-voyage to a warm climate, under careful watching against over-exercise.

“3. If a portion of lung has become disintegrated, under the influence of constitutional causes, and remains obstinately unhealed after all constitutional symptoms have been arrested, and, for some time past, no other portions of lung have shown a tendency to yield, then I think it is quite safe to secure localised rest for the disintegrated portion, so as to give it a fairer chance of healing; while an amount of air and exercise may be allowed to the patient, for the purpose of improving his reparative powers, which could not be permitted while the damaged lung was exposed to the same amount of action as the sound parts. But even here the utmost caution is required not to carry the exercise beyond a very limited amount.

“4. If the constitutional tendency to lung-disease—‘the abnormal physiological state’—is strong, and signs of impending mischief in the lungs are scattered, no localised rest should be attempted, but every means should be brought to bear upon the important object of maintaining respiration at its lowest point, consistent with life and nutrition, until the constitutional tendency has become passive and the local symptoms have been removed.

“In conclusion, to prevent misapprehension on so vital a point, let me remind my readers that, in urging ‘the importance of rest in consumption,’ I am referring to cases in which

the lungs are already damaged, or in which the constitutional disease has declared itself in sufficient force to render tuberculisation imminent. 'If the symptoms are only what is commonly called premonitory, that is, if they are those of commencing tuberculosis, and no reason or sign is discoverable which justifies the suspicion that tuberculisation has commenced; if a sufficiency of fat remains without calling upon the albuminoid tissues, the principles of treatment are quite opposite to those above detailed.' (*Tuberculosis*, 2nd edit., page 47). 'It must be admitted that the proper regulation of this matter is one of the greatest trials of the astuteness of the physician, and it is almost impossible, unless he can make the patient and his friends comprehend its meaning and importance. But not less does it test the skill and judgment of the physician to decide upon the moment when restrictions upon fresh air and exercise ought to be removed. The argument so often used when a patient appears to be 'doing well' that 'it is the best to let well alone,' may be fatal if applied to this case. The very fact that he is 'doing well' may be the sign that he must not be 'let alone;' that he is now in a state in which it is safe to make a call upon his mechanical force, to accelerate histogenesis, to supply fresh oxygen—in a word, to set about the restoration of active nutrition. And then, again, how scrupulously these new tasks should be set; how carefully watched in their effects, lest even now they cannot be continued with safety! On the first sign of their being [badly borne, they should be moderated or promptly stopped." (*True First Stage*, page 46).

VI.

ON THE DIGESTIBILITY OF GELATINE YIELDING TISSUES. (*From "The London Medical Record," Jan. 20th, 1875*).

"J. Etzinger (*Zeitschrift für Biologie*, 1874, Band x., abstract in *Centralblatt für die Medicin. Wissenschaften*, no. 45, 1874)

tested on the one hand the action of artificial gastric juice on the ligamentum nuchæ, tendon, cartilage and bone; and on the other hand fed a dog, whose excretion of nitrogen was diminished to a constant low value by being allowed to hunger for several days with the proper substances.

"The increase in the quantity of nitrogen after the supply of the above substances is taken as the standard for their utilisation in the body.

"1. *Bones*.—Bone powder, prepared by rasping the compact substance of ox-bones, dissolved tolerably richly in hydrochloric acid (0·3 per cent.). After ten days' digestion of 10 grammes (150 grains) of the powder, with in all 1,200 cubic centimètres (rather more than 40 ounces) of dilute acid, only 1·83 grammes remained undissolved. The residue was richer in organic substance than the original substance; organic substance, however, being plentiful in the solution. The dog experimented on showed, after taking 150 grammes of bone, an increase in the excretion of urea of about 8 grammes *per diem*. An absorption of lime from the bones could not be proved; on the contrary, the quantity of this mineral in the urine showed a diminution. The author supposes that the cause of this phenomenon lay in the diminished decomposition of the tissues of the body through the supply of gelatine. The phosphoric acid showed a small increase. Corresponding to this, the fæces evacuated during feeding with bones contained 308·5 grammes of ash, *i.e.*, somewhat more than the supplied bones.

"2. *Cartilage*.—Costal cartilage of a calf dissolved in not inconsiderable quantity in a 0·3 per cent. solution of hydrochloric acid (*e.g.*, 24·3 per cent.); but much more on the addition of pepsin (74·9 per cent.). After feeding with cartilage, the fæces only contained traces thereof; the excretion of urea showed an increase of about 11 grammes after feeding with 72·2 of dry cartilage at 100° Cent.

"3. *Tendons* were affected little by the action of a 0·3 per cent. solution of hydrochloric acid. After eight days' digestion the amount dissolved in the pepsin mixture was 12·05 per cent.;

on the contrary, after three days they were broken up and dissolved, and 94 per cent. had gone into solution. The solution did not form a jelly after neutralisation and evaporation. The ligamentum nuchæ of an ox conducted itself similarly; on digestion for ten days it disappeared completely, only an unimportant residue remaining. The dog, after hungering for several days, received in one day 367·1 grammes of tendon, on the next 360·3 grammes, corresponding to 245·8 grammes of the dried substance. In the fæces only a very minute quantity of tendon could be found. The excretion of nitrogen in the urine rose to 21·2 grammes (the tendon contained 46·4 grammes).

“All gelatine-yielding tissues are therefore capable of digestion and utilisation; most extensively tendon, then cartilage, and lastly bone, of which less organic substance is absorbed, probably on account of its rapid passage through the intestinal canal. The author confirms the results of Frerichs and Kühne that gelatine, by digestion with pepsin and hydrochloric acid, loses its property of gelatinising.”

VII.

NUTRITIVE ENEMATA. (*From The Lancet, Feb. 1874*).

“In the experiments upon digestion, lately performed by Czerny and Latschenberger (*Virchow's Archiv*, Band lix., Heft ii.), comparative trials were made between the materials introduced into the large intestine, and the same acted upon outside of the body with the secretion obtained from the mucous membrane. Portions of hard-boiled white of egg and shreds of fibrine remained unchanged, preserving the sharpness of their angles and borders, when exposed to the action of the mucus at a temperature of 100° for two or three hours. No emulsion could be obtained by shaking up olive oil and the mucus; and no conversion of starch into sugar could be thus produced, even

after the lapse of several hours. Similar cubes of hard-boiled white of egg were retained in the rectum in small perforated capsules for no less a period than ten weeks, and yet on withdrawal exhibited no indication of any digestive action. Experiments made with soluble albumen in like manner showed that the large intestine of man exerts no digestive action upon it.

“Other experiments, made with a view of determining the absorptive capacity of the portion of intestine under observation, and which, as before stated, was estimated at about 240 square centimetres, showed that in the course of seven hours the quantity of water that could be taken up was from 617 to 772 grains. They showed also that although the intestinal juices exerted no digestive action on albumen, and no emulsifying action on fat, yet that the walls of the intestine were capable of *absorbing* both albumen when introduced in the soluble form, and oil if it had been previously emulsified. The quantity of soluble albumen absorbed was always proportionate to the time. Any irritation applied to the intestine checked the process of absorption, and, if violent, stopped it altogether. Raw white of egg was found to be an unfavourable form for absorption. The best mode of preserving life by means of injection is often an important subject of consideration, especially in cases of cancer of the intestine; and these experiments accord with the observations and recommendations of LEUBE, that whilst comparatively little benefit can be obtained from the injection of the raw material of our ordinary diet, considerable quantities can be absorbed, and much improvement can be produced in the strength and health of the patient, if the substances have been previously subjected to operations by which they are partially digested—as, for instance, if fat be emulsified, if albumen be reduced to the soluble state, and if starch have been converted into glycose.”

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